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THE

AMERICAN REPERTORY

OF

ARTS, SCIENCES, AND MANUFACTURES.

47102

EDITED BY JAMES J. MAPES,

Professor of Chemistry and Natural Philosophy in the National Academy of Design; Honorary Member of the Scientific Institute of Brussels, of the Royal Society of St. Petersburgh, and of the Geographical Society of Paris; Member of the Lyceum of Natural History of New-York; Honorary Member of the National Academy; Corresponding Secretary of the Mechanics' Institute.

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AMERICAN REPERTORY

OF ARTS, SCIENCES, AND MANUFACTURES.

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LIME, AND ITS COMPOUNDS.

One of the most valuable substances in nature of which we have any knowledge, is lime. There are but few of the arts or occupations of civilized life that do not require its aid in the pure state, or employ one or more of the several compounds of which it is a principal constituent.

1. *Caustic* or *Quick Lime*, as it is commonly called, the purest form that lime can be reduced to except in the laboratory, is employed for making mortar cements; for clarifying the juice of the sugar cane and the beet root; for purifying coal gas; for rendering the potash and soda of commerce caustic in soap manufacture and in the bleaching of cotton; for purifying animal matters before dissolving out their gelatine; for cleaning hides of their hair in tanneries; for extracting the pure volatile alkali from muriate or sulphate of ammonia; for rendering confined portions of air very dry; for stopping the leakage of stone reservoirs, when mixed with clay and thrown into the water; for making a powerful lute with white of egg or serum of blood; for preparing a depilatory pomade with sulphuret of arsenic;* in conducting many chemical researches; and very extensively in agriculture, especially in England, where it ranks quite as highly as gypsum does with the American farmer, and

* Dr. Ure.

has produced results equally surprising and beneficial. Lime water is much used in medicine.

2. *Carbonate of Lime*, which includes chalk, the marbles, alabaster, and various other minerals, is employed in architecture; in sculpture; in lithography; in agriculture; for forming crayons; as a base for water colors in painting; for the production of *Spanish white;* for making artificial carbonated waters; as a flux for certain ores, &c. It is from carbonate of lime that quicklime is procured by calcination.

3. *Gypsum* or *Plaster of Paris*, a compound of lime and sulphuric acid, is employed for making mortar cements; for taking impressions of medals and similar objects; for casting statuary in moulds; for making stucco and other ornamental works; for forming potters' moulds; for enameling cards; for making carved and turned ornaments—one variety of it much resembling alabaster; and for some other less important purposes. The greatest value of gypsum consists in its applicability as a manure to certain kinds of impoverished soils; it has been very extensively put to this use in France and the United States, with the happiest results. Dutchess county, in this state, until the discovery of the fertilizing properties of gypsum was proverbially one of the poorest districts under cultivation: it is now one of the most productive, and the change is due solely to the use of this mineral as a manure.

4. *Phosphate of Lime* is one of the materials used in making fine china ware, some kinds of enamel, and in the construction of laboratory furnaces; it is employed for making cupels; for forming with silicate of alumina a brown glazing that will resist the action of very intense heat; and for procuring phosphorus: this substance is obtained almost wholly from bones, of which phosphate of lime constitutes a principal part.

5. *Fluate of Lime*, or *Derbyshire spar*, is employed in pyrotechny; for corroding glass by yielding up its fluoric acid; for making carved and turned ornaments; as a flux for certain ores; and in the formation of several choice enamels.

These include all the natural forms of lime that are most used in the arts. It is also combined in many of the products of vegetation with acetic, malic, tartaric, &c. acids; but in these

states it is interesting only to the chemist. Certain processes derive much assistance from artificial compounds of lime and an acid; as the *chloride of lime* or *bleaching salts*, an indispensable agent in the present mode of bleaching cottons, &c. and similar compounds are oftentimes the residual products of manufacturing operations, as in the making of saltpetre and borax, where lime is left in combination with nitric, muriatic, and boracic acids.

1. QUICKLIME.

Although lime in combination with other substances is very plentifully diffused over the earth, it is not found in a caustic state except as an accidental volcanic production. From the state of a carbonate, however, that form in which it most abounds, constituting, as it has been estimated by mineralogists, about one-eighth part of the exterior crust of the globe, it is easily reduced to quicklime, and by a process so simple that probably it was known to man long before he ceased to be a 'dweller in tents.' That the art of making lime cements was perfectly understood in the earlier ages, is certain, from the remains of many splendid temples and structures of antiquity that are yet to be seen in the old world, and which owe their partial preservation quite as much to the goodness of the mortars as to the indestructible nature of the other materials used in their construction. In this, as in some other instances, we have very little reason to boast of a knowledge superior to that of the ancients; and yet, when we reflect upon the progress they made in arts of a much more difficult nature, it should not excite surprise that they carried to perfection, or nearly so, one affecting their comfort and ministering to their pride so much as the art of manufacturing lime, and employing it for the purpose to which it is most obviously adapted.

Manufacture.—Lime is prepared in the large way by subjecting the natural carbonates of lime to a high heat, which expels the carbonic acid in a gaseous form, and leaves the lime in a caustic state fit for the various purposes before named.

Of the several carbonates found in nature, amounting to more than a dozen if every sub-species and variety is enumerated, those usually preferred for calcination are the *marbles* or

granular limestone, *compact limestone*, *chalk*, and *oyster shells*. A description of the two latter substances will be unnecessary, as the one is not found in the United States, and the external appearances of the other are well known. The two former varieties resemble each other in many of their characteristics. They are slightly variable in hardness, but may always be scratched by iron: specimens are occasionally found that, owing to the presence of siliceous particles, give out sparks with steel; their specific gravity usually lies between 2.4 and 2.8. They are soluble in nitric acid, accompanied by effervescence, from the liberation of the carbonic acid: before the blowpipe they decrepitate, carbonic acid is driven off, and quicklime, whose taste is so well known, remains.

Granular limestone presents an irregular, crystalized appearance, the grains varying from coarse to very fine. Its color is most commonly white or gray, often snow white, (as thus found it has been very aptly compared to white sugar in solid masses) and sometimes grayish black; but occasionally it presents certain shades of blue, green, red, or yellow. It is more or less translucent, but in the dark colored varieties at the edges only.

Compact limestone, in point of color and translucency, very nearly resembles granular limestone, except that it is rarely or never found perfectly white; the predominating color is gray, mingled often with shades of yellow, blue, &c. and indeed varying from grayish white to grayish black. It usually occurs in extensive, solid, compact masses, whose fracture is dull, splintery, or even, and sometimes conchoidal, but occasionally it is found with a loose, earthy texture. It is seldom, perhaps never, a pure carbonate, but contains from 2 to 12 per cent of silex, alumine, and the oxide of iron, on the last of which its diversified colors depend. In fact, by increasing the proportion of argillaceous matter, it passes into marl. Some limestones, which effervesce considerably, are still so impure that they melt rather than burn to lime.*

The process of lime burning is, as we have said, very simple and easily conducted; but the most profitable results can only

* Cleaveland.

be secured by strict attention to the quality of the calcareous stone employed, the degree of calcination required to fit it for the use it will be ultimately put to; and by the exercise of great care in the form and construction of the kiln: upon this last, especially, depends the largest and best return, with the least consumption of fuel.

Form of Kiln.—The most common form of lime-kiln is made by digging a hole of a conical shape in the side of a hill, and lining it with stones laid dry upon each other, the aperture at the top being merely sufficient for the free passage through it of the moisture and gases that are driven off during the process of calcination. Sometimes the hole is lined with fire-brick, or with stones laid in wet clay to fill the interstices.

In the bottom of the kiln fuel is laid, consisting usually of faggots or brushwood, and upon this the limestones and fuel are placed in alternate layers, the former being arranged in such a manner as to leave the largest possible openings for the passage of the flame through them. The fuel at the bottom is fired, and the charge allowed to burn out. When the lime is sufficiently cooled it is withdrawn, and the kiln re-charged as before. Several kilns of this description may yet be seen on the shores of the Hudson river, in the vicinity of the highlands: they should never be resorted to, except for temporary purposes or where fuel is very plenty and labor of little value.

(TO BE CONTINUED.)

[For the American Repertory.]

LYCEUM OF NATURAL HISTORY.

PROCEEDINGS.

November. Dr. Draper reported that the siliceous substance presented some time since contained no traces of fossil animalcules, as formerly supposed. Dr. Budd exhibited a large specimen of the Panopæa Aldrovandi. Mr. Wheatley presented three specimens of copper ore from Cuba: he also exhibited some fossil shells from the greensand formation, near York river, Alabama, among which were Cuculloca, Chama, and Cardita. Mr. Stillman presented a species of Physa, believed

to be undescribed. Messrs. Sherwood, Redfield, Delafield, De Kay, Redfield, Hicks, Jay, Carey, Smith and Russel presented six volumes of the Transactions of the American Philosophical Society. The American Philosophical Society presented the following works, viz :—Report on the Epidemic Cholera; Du Ponceau's discourse on Foreign Literature and Science; Eulogium on David Rittenhouse; Descrip. Cat. of the Chinese Col. in Philadelphia; Memoir of Thomas James, M. D.; Discourse on the influence of America on the Mind; Report of the Medical Missionary Soc. in China; Marshall's Arbustrum Americanum, and several pamphlets. Report of the British Association for the Advancement of Science, for 1839, was received from the Association. Proceedings of the Royal Society, Nos. 43 and 44; Catal. of Scientific Books in the Library of the Roy. Soc.; Trans. of the Roy. Soc. 1840, part i, and the List of Members, were received from the Society.

Mr. Brevoort exhibited specimens of fossil fish from Boontown, N. J., among which were several known species of Paleoniscus, and also a new species. Mr. Parnell, of Edinburgh, presented an Essay on the Nat. Hist. of the fish of the Frith of Forth: thanks of the Society were voted to Mr. P. Mr. J. Lea, of Philadelphia, presented Notices of the oolitic formation in America, with description of some of its organic remains. Dr. Jay presented, Description of the animal to which belongs the shell called by Ferrusac Helicomax Lamarkii; Remarks on the nature of the respiratory organs in certain littoral mollusca of Madeira; Remarks on the genera Melampus, Pedipes, and Truncatella; Sowerby's genera of recent and fossil shells; By-Laws of the N. Y. Hist. Society; Message of the President on the Tobacco Trade; Constitution of the National Institute, at Washington; also, a specimen of Scutella quadreforma from Rio; Cannel coal, and two specimens supposed to be the sperm of the muscle. Dr. Lee presented a live insect, found in the envelop of a mummy of the Ibis, lately brought from Egypt, and now in the possession of the Naval Lyceum, Brooklyn; also, a piece of the envelop. The insect was referred to Mr. Halsey for examination. Mr. Bronson presented Sonnini's continuation of Buffon's Nat. Hist. 59 volumes. Thanks of the Society were

voted to Mr. Bronson for his valuable donation. Mr. F. Browley presented, "Spectacle de la Nature," or Nature Displayed, printed 1740, a curious work. Thanks were voted to Mr. Browley. Mr. Fairley exhibited a curious formation of limestone rock from Niagara, consisting of hemispherical impressions, which were perceptible through several layers of the rock.

The American Repertory, vol. ii, No. 4, and Audubon's Birds of America, Nos. 20 and 21, were received.

Dr. Gardner was elected a corresponding member, and Isaac Green and David P. Holton resident members.

December. Mr. Halsey, to whom was referred the insect presented by Dr. Lee, found in the envelop of the mummy of the Ibis, reported that it is a species inhabiting this country, and known as Trogosita depression of Pal. de Beaior.: its appearance in or near the mummy must have been accidental, as not being a carnivorous insect, it would not be attracted thither in search of food. It belongs to the xylophagous or wood-eating section of Latreillis Tetramirous coleoptera, and is usually taken under the bark of trees, on decayed fruit, or other vegetable matter. Mr. H. also exhibited a specimen of the Scutigera Araneoides, found in this city: he remarked that this insect had never before, to his knowledge, been found in this country.

Dr. Gray presented in behalf of Mr. Decandolle the following works: Monographie des Campanulée; Memoire sur les Lobeliacée et sur la Nouvelle Famille des Cyphiacée; Description d'une Nouvelle Espèce de Figuier, (Ficus Saussureanna.) Thanks of the Society were voted to Prof. Decandolle. Mr. Cramer presented Etwas der uber die Natur-Wunder in Nord-America, part ii. Dr. Brinckerhoff presented a fine specimen of Spongia, found in our bay. Mr. J. Bell presented a piece of polished limestone from Niagara, exhibiting the peculiarities of the specimen shown last month by Mr. Fairley. Mr. W. C. Redfield presented the following fossils from the tertiary of Washington, N.C: Pecten, Ostrea, Pectunculus, Cardita, Venus, and Turitella. Mr. Gibbs exhibited specimens of Pectenaria from the shores of Hallett's Cove; also, a curious animal substance in sand, from the same place: referred to Dr. De Kay for examination. Mr. Wheatley exhibited a mass of fossils

from a boulder on Staten Island, taken from an excavation 10 feet below the surface. Mr. Cozzens exhibited a geological map and suite of rocks, illustrating the geology of the country from Williamstown, Mass. to Clarkesville, N. York. Dr. Jay presented specimens of the animal of the Pyrula caniculata of the mytilus, and an animal with its shell belonging to the family Solenides, probably a young glycemeris. Mr. J. Lapham presented Catalogue of Plants found in the vicinity of Milwaukie.

The American Repertory, vol. ii, No. 5, Boston Journal of Nat. Hist. vol. iii, No. 3, Annals and Mag. of Nat. Hist. No. 36, and Audubon's Birds of America, No. 22, were received.

The following gentlemen were elected: Dr. Forbes, of London, corresponding member; Mr. J. C. Bevoort and Mr. F. J. Hawlen, resident members. B.

[For the American Repertory.]

VELOCITY OF FLUIDS.

The difference of velocity resulting from *difference* in specific gravity, in various fluids subjected to *equal* pressures, is a subject not only interesting but of much practical importance. An engineer is constantly called upon, in the exercise of his profession, to calculate the velocity of water, mercury, air and steam, produced by various pressures. A few words on the theory which determines these velocities will therefore not be unacceptable to your mechanical readers.

Prof. Joslin, in his ingenious "explanation of the support of a spherical body on a jet of water," (Repertory, vol. iii, p. 243) states, in alluding to the different effect produced by a current of air, "that owing to the great difference between air and water in point of specific gravity, air issues with a velocity more than 800 times that of water under the same pressure." This statement, no doubt, was made under the impression that the velocity generated will be in the inverse ratio of the specific gravity of air and water. This, indeed, is a popular error, the importance of which will readily be admitted when I state that the velocity of air compared to that of water, under equal pressure, even in rushing into a vacuum, so far from being 800 times,

as stated by Prof. Joslin, will only be *twenty-nine times*. This I will endeavor to prove by the following brief demonstration, and also that the velocities of either fluid or gaseous bodies will be, when subjected to equal pressures, *in the inverse ratio of the square roots of their specific gravities.*

It is a fundamental principle in hydrostatics, that a fluid issuing from a jet perpendicularly, will be projected to a point level with the fluid which supplies it, minus the resistance of the air, and the obstruction in the channel and at the orifice; hence it will be perceived that the velocity with which the fluid issues will be equal to the velocity generated by a heavy body falling freely through a space equal to the altitude of the fluid. By applying the well-known law of gravitation, we are therefore enabled at once to determine the velocity of any fluid or gas by its specific gravity.

It is evident that by knowing the specific gravity, the column corresponding to any given pressure can easily be calculated: in other words, what *height* of column would be requisite to produce by virtue of the gravitation of its particles, the desired pressure.

The specific gravity of water at the temperature of 60° being 1, that of mercury will be 13.58, and that of air 0.00119 also at the same temperature; it therefore follows, that to produce a pressure of 15 pounds to the square inch requires a column of mercury 2.545 feet, a column of water of 34.56 feet, and a column of air of uniform density of 29030 feet. On these premises I will now proceed to prove that the velocity will be in the inverse ratio of the square root of the specific gravity of each respective fluid, as before stated.

A heavy body falling freely will pass through a space of 12.08 feet in the first second, and then attain a velocity of 32.16 feet per second; hence the velocity generated in falling through 2.545 feet will be $\sqrt{64.32\times2.545}=12.8$ feet per second; that is, the velocity of mercury, when issuing from an orifice under a pressure of 15 pounds to the square inch. The velocity of water under the same pressure, or 34.56 feet column, will on the same ground be $\sqrt{34.56\times64.32}=47.1$ feet per second, and the velo-

city of air also under the same pressure $\sqrt{29030 \times 64.32} = 1366$ feet per second. This latter velocity, contrasted to the velocity of 47.1 feet for water, proves Prof. Joslin's estimate of the comparative velocity of air and water, under equal pressure, to be altogether overstated, and that 29 should be substituted for 800 as the true difference of velocity between air and water, in consequence of the difference of the specific gravity of these substances.

I must here observe, that although the *comparative* velocities thus established are correct, still the *actual* velocities will, from reasons before stated, fall very much short of the amount given. Long practice and numerous experiments instituted for the purpose of ascertaining the true relation between the theoretical and actual velocity of a body, under the circumstances before stated, prove that the latter velocity, whether the substance be fluid or gaseous, is $\frac{625}{1000}$ of the former: thus, by simply multiplying the *calculated* velocity by the decimal 0.625, the *real* velocity will be obtained.

Respecting the statement as to the relation that the velocity of a body bears to the square root of its specific gravity, the following exposition of figures will prove its accuracy:—

	Comparative Velocity.	Specific Gravity.	Sq. Root of Spe. Grav.
Mercury..	12.8.....	13.58	.....3.6800
Water ...	47.1.....	1.00	.....1.0000
Air	1366.0.....	0.0019	.....0.0344

By inspecting the amounts in the third column, it will be found that they are to each other in the inverse ratio of the corresponding amounts in the first column. Thus, for instance, by the calculated velocity of water, that of mercury will be ascertained by the following analogy, 3.680 : 1000=47.1 : 12.8; and in like manner the velocity of any other fluid or gas may be determined by this same analogy, simply substituting for the first number in the analogy the specific gravity of the fluid or gas under consideration.

J. E.

For the American Repertory.

NEW MATHEMATICAL INSTRUMENTS.

Deeming mathematical science, as applied to navigation and civil engineering, of the first importance, both as respects our foreign and domestic relations; believing also that any improvement connected therewith, however slight, cannot be entirely uninteresting to those who are friendly to the promotion of science and our commercial interests, I submit to the readers of your valuable journal the following brief description of a new mathematical instrument, intended for measuring the bearing and altitude of celestial objects, which is accomplished by one operation. As it is intended exclusively for determining the position of celestial objects, I have named it the *Mariner's Celestial Protractor*.

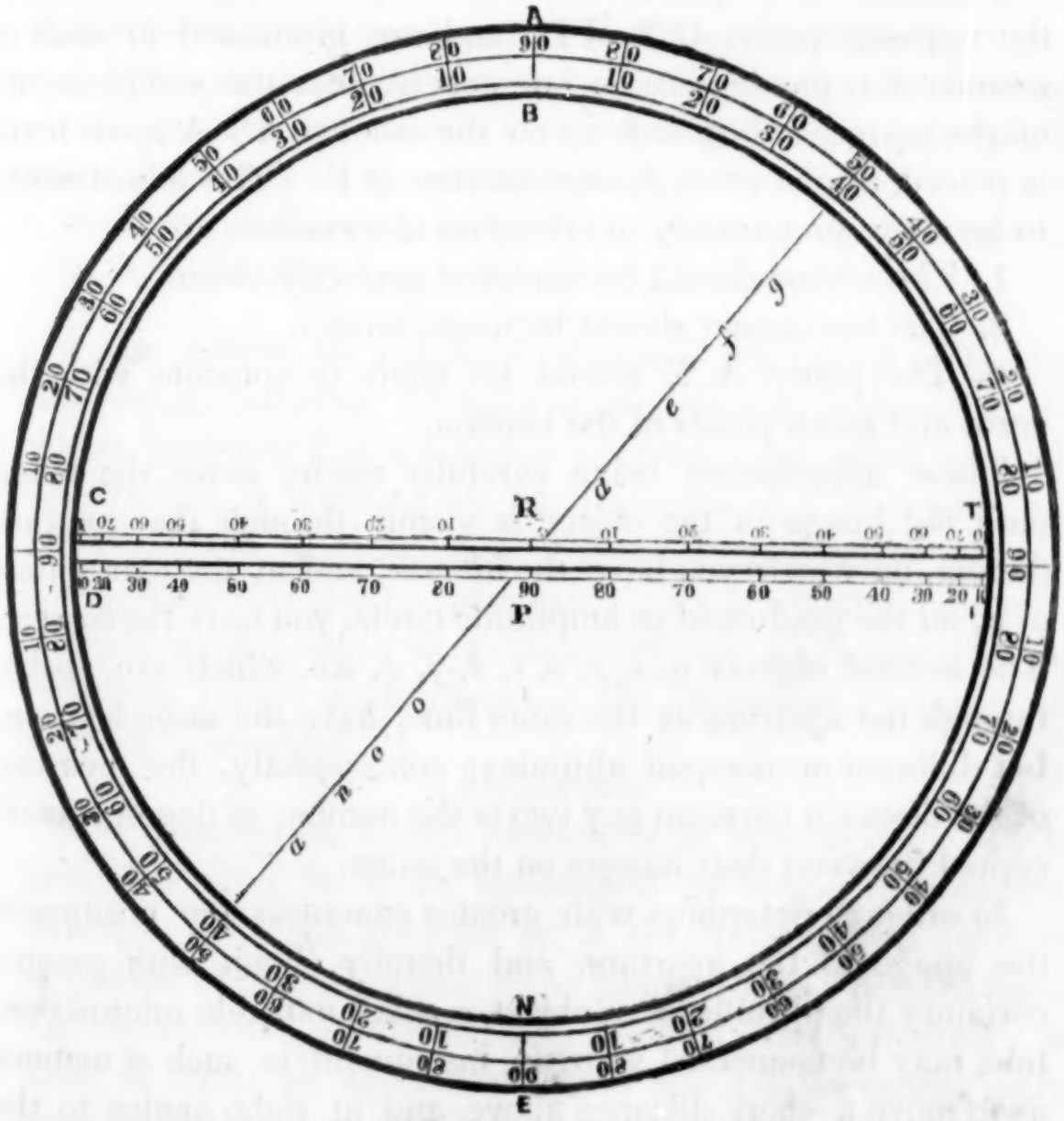

FIG. 1—Mariners' Celestial Protractor.

Description of the Mariner's Celestial Protractor.

At the bottom of a metallic hemispherical mirror is affixed a graduated brass circle A E (Fig. 1) the limb of which is divided into degrees, &c., similar to a theodolite or circumferenter. Around the inner extremity of this circle, and nearly in contact with the mirror, is a circular groove, in which a thin metallic circle N I T B C D is intended to revolve. This circle should be very nicely fitted in the groove, and the upper surface made to coincide exactly with that of the graduated circle in which it revolves.

Attached to the circle N I T B C D is a semicircle T I P D C R passing directly over the top of the mirror. This semicircle, which is technically termed index, is composed of two similar parts, exactly parallel, having a narrow aperture between them: they are connected with the movable circle at the opposite points C T, I D, and are graduated in such a manner that the degrees on one part express the complements of the corresponding degrees on the other part. A spirit level is placed at the point A, and another at E. The adjustments to be made preparatory to taking an observation, are—

1. The mirror should be rendered perfectly clean.
2. The instrument should be made level.
3. The points A E should be made to coincide with the north and south points of the horizon.

These adjustments being carefully made, move the index until the image of the object is visible through the aperture therein, on which you have the *altitude*, and at the extremities of it, on the graduated or amplitude circle, you have the *bearing*. The several objects *a*, *n*, *c*, *o*, *e*, *d*, *f*, *g*, &c. which are visible through the aperture at the same time, have the same bearing, but different or unequal altitudes; consequently, the measure of the distance between any two is the number of degrees intercepted between their images on the index.

In order to determine with greater exactness the position of the image in the aperture, and thereby obtain with greater certainty the altitude of an object, a small movable microscopic tube may be connected with the instrument in such a manner as to move a short distance above and at right angles to the

index; and by attaching to the tube a nonius or vernier, exceedingly small portions of the graduated limb of the index could be estimated with accuracy. In order, also, to measure bearings with greater precision, a nonius or vernier may be affixed to the amplitude circle.

A magnetic needle may be connected with the instrument in such a manner as to give the bearing of objects on the limbs of the amplitude circle. In this arrangement the index would be connected and movable with the amplitude circle and mirror, the whole movable about a common centre.

A third arrangement, which is perhaps better adapted to nautical purposes than either of the foregoing, is to adjust to the bottom of the instrument a magnetic needle, in such a manner as to give the bearing of objects on the amplitude circle, the circle being connected and movable with the index. This modification would possess the following advantages:

1. The necessity of the second adjustment would be obviated, since the amplitude circle being movable, the needle would give the bearing on the graduated limb.
2. The use of the circle N I T B C D would be obviated.
3. The liability to error would be diminished.

I also submit the following plan and description of another instrument, intended for land surveying and engineering, for which purposes it is admirably adapted, since, when properly constructed, it answers all the purposes of a theodolite and quadrant, and when supplied with a magnetic needle, those of a circumferenter and traverse table. As this instrument is universally applicable in all arithmetical and trigonometrical calculations, I have denominated it *The Terrestrial Protractor and Universal Calculator.*

DESCRIPTION.

The description of this instrument is very simple; but its principles may be better understood by considering its construction. For this purpose, let A B C (Fig. 2) be a quadrant or quarter of a circle, which let us suppose to be a plate of brass. Let the arch B C be divided into 90 equal parts or degrees; let each of these be again subdivided into smaller parts, corresponding to the size of the plate.

2. Let the radius A B be divided into 10 equal parts, and numbered from A in the direction of B: let each of these be again subdivided into 10 other equal parts: then, if each one of the primary or larger divisions be supposed to represent 10, each one of the smaller divisions will represent 1, and the whole radius will represent 100. In the same manner, if each of the smaller divisions be supposed to represent 10, each one of the primary or larger divisions will represent 100, and the whole radius will represent 1000. From each point of division in the radius A B, let lines be drawn parallel to A C, and produced until they intercept the graduated limb of the instrument. The same operations are to be performed in respect to the radius A C. These lines will represent the sines and cosines of the several angles at the centre subtending them. A small index A D, of the same length, and graduated in the same manner with either radius, is movable about the centre A.

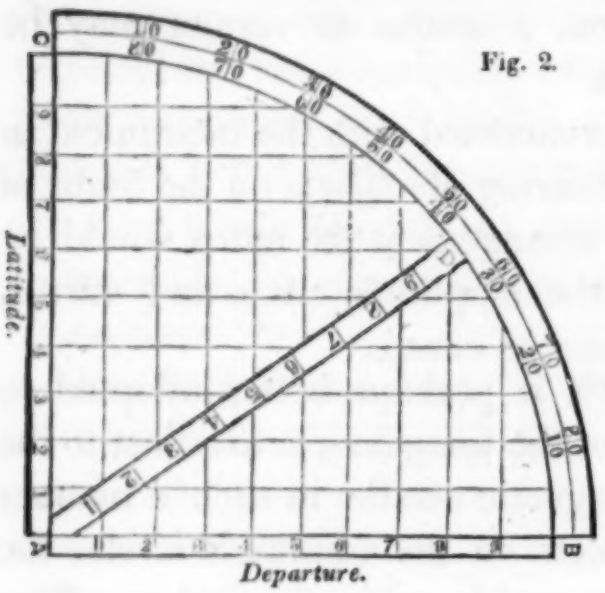

Fig. 2.

With this brief description, I shall now proceed to give a few of the general methods of calculating by the instrument, which, if the foregoing description be well considered, must necessarily be very simple.

Problem I. Three numbers given, to find a fourth proportional.

Solution. If the first term exceed the second, move the index until the first term thereon coincides with the second on A B or *Departure*, the number on *Departure* corresponding to the third term on the index, will be the fourth proportional; but if the second exceed the first term, move the index until the first term on *Departure* coincides with the second term on the index, the number on the index corresponding to the third term on *Departure*, will be the fourth proportional.

[*Note.*—As the foregoing solution is compounded of multiplication and division, the method of performing each will be obvious.]

Problem II. To reduce Federal Money to New England currency.

Solution. Seventy-two pence is equal in value to 100 cents: if, therefore, 100 on the index be made to correspond with 72 on *Latitude*, the index will represent cents, and *Latitude* will represent pence. Thus, 36 on *Latitude* will correspond to 50 on the index, since 36 pence is equal in value to 50 cents: in the same manner, 75 on the index will correspond to 54 on *Latitude*. Hence it will be perceived that this forms a perfect table either for reducing pence to cents, or cents to pence, which may be converted into a variety of other tables with the greatest facility. For instance: if it were required to construct a table for reducing dimes to shillings Vermont currency, it could be performed in a much less space of time than I am in writing this. The ratio between the shilling and dime is as 100 to 60: if, therefore, 100 on the index be made to correspond with 60 on *Latitude*, a perfect table is formed showing the corresponding value in shillings of any number of dimes, and *vice versâ*.

If 25 on the index be made to correspond with 20 on *Latitude*, a perfect table is formed for reducing shillings New-York currency to dimes, and the contrary.

If 100 on the index be made to correspond with 30 on *Latitude*, a perfect table is formed for reducing pounds to dollars, and the contrary: in this table the index will express dollars, and *Latitude* pounds.

If 100 on the index be made to correspond with 75 on *Latitude*, a table is formed for reducing New-York to New England and Virginia currency, and the contrary: the index will express New-York currency, and *Latitude* New England, &c.

If 100 on the index be made to correspond with 80 on *Latitude*, a table is formed for reducing New Hampshire to New Jersey, Pennsylvania, Delaware and Maryland currency: the index will express New Jersey, Pennsylvania, Delaware, &c. and *Latitude* New Hampshire currency.

If 64 on the index be made to correspond with 50 on *Latitude*, a table will be formed for reducing New Hampshire to South Carolina and Georgia currency: the index will express New Hampshire currency, and *Latitude* South Carolina, &c.

I have now given the elements for producing six arithmetical tables, which can be accomplished in less than half a minute. How long a period of time would be requisite to produce these tables by the ordinary numerical process, when subjected to calculation, I leave for those acquainted with the subject to determine. These tables are mere examples of the simplest kind, given to illustrate the principles upon which the operation of the instrument is based. The principles here laid down can be applied universally to solving the most abstruse arithmetical problems, and to the construction of the most intricate tables. Indeed, I do not think there is a single exception.

The instrument is peculiarly adapted to trigonometrical calculations, since it is of itself a complete trigonometrical canon.

To find the sine and cosine of any given angle, and corresponding to any given radius:

Move the index from B in the direction of C until its extremity D coincides with the given angle on the inner arc. The numbers on *Departure* and *Latitude* corresponding with the given radius on the index, will express the sine and cosine respectively.

To find the secant and cosecant answering to any given angle and corresponding with any given radius:

Set the index to the given angle as before: the numbers on the index corresponding with the given radius on *Departure* and *Latitude* will express the secant and cosecant respectively.

[*Note.*—The tangent and cotangent are found in a similar manner.]

SOLUTION OF RIGHT-ANGLED TRIANGLES.

Case I.—Given the hypothenuse and the angle at the base, to find the base and perpendicular.

Solution.—Move the index from B in the direction of C until it coincides with the given angle on the inner arc, the numbers on *Departure* and *Latitude* corresponding with the hypothenuse on the index will express the base and perpendicular respectively.

Case II.—The hypothenuse and base given, to determine the angles and perpendicular.

Solution.—Move the index from B in the direction of C until

the hypothenuse thereon coincides with the base on *Departure*: the corresponding number on *Latitude* will express the perpendicular, the degrees at the extremity of the index on the inner and outer arcs will express the angle at and opposite the base respectively.

Case III. The hypothenuse and perpendicular given, to determine the base and angles.

Solution. Move the index, as before, until the hypothenuse coincides with the perpendicular on *Latitude;* the corresponding number on *Departure* will express the base, the degrees at the extremity of the index on the inner and outer arcs will express the angle at and opposite the base respectively.

Case IV. The base and angle at the base given, to determine the hypothenuse and perpendicular.

Solution. Set the index to the given angle on the inner arc: the numbers on the index and *Latitude* corresponding to the base on *Departure* will express the hypothenuse and perpendicular respectively.

Case V. The perpendicular and angle at the base given, to determine the hypothenuse and base.

Solution. Set the index to the given angle on the inner arc: the numbers on the index and *Departure* corresponding with the perpendicular on *Latitude* will express the hypothenuse and base respectively.

Case VI. The base and perpendicular given, to determine the hypothenuse and angles.

Solution. Move the index until it corresponds with the base on *Departure* and the perpendicular on *Latitude;* the corresponding number on the index will express the hypothenuse, the corresponding degrees on the inner and outer arcs will express the angle at and opposite the base respectively.

By merely moving the index, then, we may solve any case in right-angled plane trigonometry with the greatest facility; the process of doing which will be rendered more simple from the following generalization :—

1. Bases, whether known or unknown, are always to be estimated on *Departure.*

2. Perpendiculars are always to be estimated on *Latitude.*

3. Hypothenuses, whether given or required, are to be estimated on the index.

4. The angle at the base is always to be estimated on the inner arc.

5. Angles opposite the base are always to be estimated on the outer arc.

Having given a few examples of the general methods of calculating with the instrument, I shall now proceed briefly to show the manner of applying it in surveying and engineering.

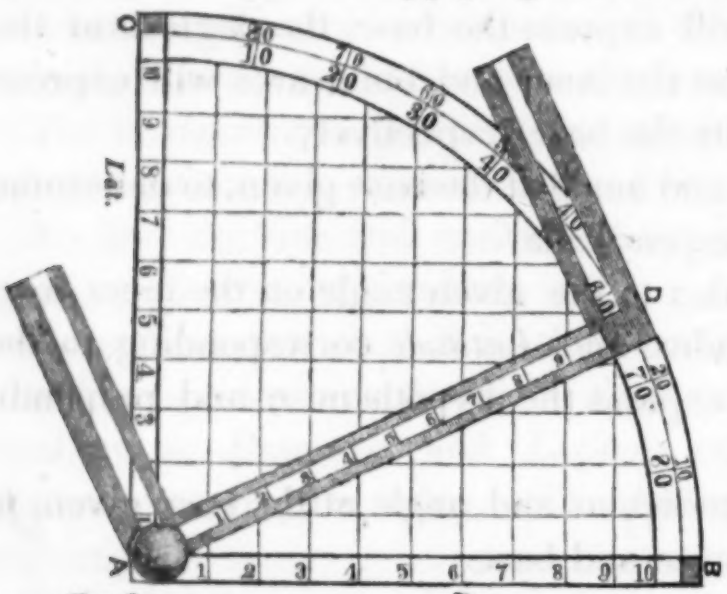

FIG. 3.

By having a sight affixed to each end of the index, as in Fig. 3, horizontal angles could be taken without the use of the needle: vertical angles of elevation and depression could be taken with the same facility as horizontal angles. A magnetic needle may be connected with the instrument in such a manner as to give the bearing of objects on the arc. This would be particularly desirable, since, when running lines, the latitude and departure corresponding to each would always be given on the instrument; and to preserve which, it would only be requisite to record them in the field book, which would be done with the courses and distances. By this arrangement the engineer would at any time be able to close or balance the survey almost instantly, saving an immense amount of time and labor, insomuch that a given quantity of surveying could generally be performed in nearly half the time that would be requisite with any instrument now in use.

In measuring the heights and distances of inaccessible objects, the requisite data could be obtained with more accuracy and with far greater facility than with any other instrument; and which being obtained, the calculations could be made almost instantly, and generally with great precision. It is true that

the accuracy which pervades all numerical operations by symbols can hardly be expected in the solution of a problem upon any mathematical instrument whatever.

The advantages which this instrument possesses over those in general use are almost incalculable. Its extreme simplicity, which even if it possessed no other advantages would render it decidedly preferable; its extensive application in the arts; its almost universal application in mathematical calculations; and, withal, the astonishing rapidity with which it may be made to produce various arithmetical and trigonometrical tables, are qualities possessed by no other instrument, and which cannot fail to render it a most valuable acquisition to the practitioners of the various arts based on mathematical science.

NOTES.

By introducing a line of logarithms on each radius and the index, various nautical and astronomical tables could be produced with great facility.

A micrometer screw may be made to act on a small cog wheel connected with the index at the centre, to which a small graduated circle with a movable index may also be connected. By this arrangement exceedingly small angles could be estimated with accuracy. An ordinary nonius, however, would be better adapted to most practical purposes.

It affords me much pleasure to acknowledge the benefit derived from several original suggestions, together with two highly ingenious methods for constructing the instruments, by my much esteemed friend, Ransom Cook, of Saratoga Springs, to whom the mechanic arts and electro-magnetism are much indebted.

The foregoing methods of applying the instruments are general, and the illustrations themselves are elementary. More particular descriptions, together with their applications to particular purposes, will be given in a future number.

I have several other new mathematical instruments; among which is a very curious Pocket Calculator, a plan and description of which will also be given in the Repertory.

J. A. POWERS, *Civil Engineer.*

No. 99 Reade Street, New-York.

[For the American Repertory.]

ON THE EFFECTS OF ARTS, TRADES, AND PROFESSIONS, AS WELL AS HABITS OF LIVING, ON HEALTH AND LONGEVITY.

No. XIII.

Carbonic Acid Gas.—Among the mineral gases inimical to human life, this may be ranked as one of the most important. It abounds in many manufacturing establishments, as well as in all ill-ventilated apartments, being thrown off by many processes in the arts, as well as constantly produced by the act of respiration and combustion. It is consequently the frequent source of impaired health as well as of fatal accidents.

In the burning of fuel, carbonic acid gas is constantly extricated: it is also abundantly given out in the calcining of lime, and in the fermentation of beer, cider, and wine. We find it abounding in mines and caverns, in coal-pits and draw-wells, and in all apartments where fuel is burnt without provision for a supply of pure air, or where many persons are crowded together. We accordingly often hear of the loss of life from descending into wells, or sleeping in rooms warmed by charcoal, or before the traps of lime-kilns; and in England many persons have perished by suffocation in beer-vats, and even by sleeping in greenhouses during the night, or in very small rooms.

It has been a question among physiologists, whether carbonic acid gas be a positive poison, or simply an asphyxiating gas. It is now, however, conceded that it possesses active poisonous properties, from the fact that its effects are much more rapidly produced, and more slowly and imperfectly removed, than asphyxia from immersion in hydrogen or nitrogen. According to Christison it is unequivocally established by the three following facts:—

"In the first place, if, instead of the nitrogen gas contained in atmospheric air, carbonic acid gas be mixed with oxygen in the same proportion, animals cannot breathe this atmosphere for two minutes without being seized with symptoms of poisoning: even a much less proportion has the same effect. Persons have even become apoplectic in an atmosphere of carbonic acid

gas, which to those who entered it appeared at first quite respirable.—Secondly, *Professor Rolando*, of Turin, having found that the land tortoise sustained very little injury when the great air-tube of one lung was tied—contrived to make it breathe carbonic acid gas with one lung, while atmospheric air was inhaled by the other; and he remarked that death took place in a few hours.—Thirdly, the symptoms caused by inhaling the gas may be also produced by its application to the inner membrane of the stomach or to the skin. On the other hand, aërated water has been known to cause giddiness, or even intoxication, when drunk too freely at first; and the sparkling wines probably owe their rapid power of intoxicating to the carbonic acid they contain. And, on the other hand, *M. Collard de Martigny* has found that if the human body be enclosed in an atmosphere of the gas, due precautions being taken to preserve the free access of common air to the lungs, the usual symptoms of poisoning with carbonic acid are produced, such as weight in the head, obscurity of sight, pain in the temples, ringing in the ears, giddiness, and an undefinable feeling of terror; and that if the same experiments be made on animals, and continued long enough, death will be the consequence."

It is a fact ascertained by Sir Humphrey Davy, that if a man attempts to breathe pure carbonic gas, the nostrils and throat are irritated so strongly as to close the glottis, and respiration becomes impossible. The gas also causes an acid taste in the mouth and throat, and a sense of burning in the uvula. Christison states that he has remarked the same effects from very pure gas, disengaged by tartaric acid from carbonate of soda. Hence the conclusion is, that when a person is immersed in the gas nearly or perfectly pure, as in a beer-vat, or old well, he dies at once of suffocation.

It is an important fact, not generally known, that there may be danger in descending wells or pits where the air is sufficiently pure to support a light, and where no danger is indicated by the sense of smell. Such a case is related by M. Chomel, of Paris, where a person descended to the bottom of a well, and remained there for the space of three quarters of an hour. He was first affected with violent and irregular convulsions of the

whole body, and perfect insensibility; afterwards with spasms, resembling tetanus; and during the second day, when these symptoms had gone off, he continued to be affected with dumbness. Another case is related by M. Collard de Martigny, where a servant, on entering a cellar where grape juice was fermenting, became suddenly giddy, and under a vague impression of terror, fled from the place, dropping her candle on the floor and shutting the door behind her. She fell down insensible outside the door, and those who went to her assistance found, on opening the door, that the light continued to burn. There are other similar cases on record, going to show that a light may burn in an atmosphere unfitted to sustain life. Frequent accidents occur from the fumes of burning charcoal, and it would seem that none could be ignorant of their deleterious effects; and yet we infer this to be the case, from the frequency with which we are called to prescribe for persons who have suffered from this cause, especially on board of vessels. The first symptoms are slight oppression, then violent palpitation, and next confusion of ideas, ending in insensibility. As it is important to recognize the symptoms of poisoning by charcoal, for the purpose of speedily applying remedial measures, we shall present the following history of a case by Dr. Babington:

A waiter of a tavern and boy, on going to bed, left a chaffer of charcoal burning in the room, and next morning were found insensible. The boy died immediately after they were discovered. The waiter had apoplectic symptoms, such as stertorous breathing, livid lips, flushed face, and a full, strong pulse, for which he was bled ten ounces. When Dr. B. first saw him, however, the pulse had become feeble, the breathing imperfect, and the limbs cold; the muscles were powerless and twitched with slight convulsions, the sensibility gone, the face pale, the eyelids closed, the eyes prominent and rolling, the tongue swollen, and the jaw locked upon it, and there was a great flow of saliva from the mouth. These symptoms were somewhat relieved by galvanism; but as it seemed to be followed by still greater prostration, after a short time its application was suspended. Cold water was dashed upon him, ammonia rubbed on the chest, oxygen thrown into the lungs, and through these

means a warm perspiration was soon brought out, and his state rapidly improved. The next day he was able to speak; but for two days afterward the left side of the face was paralyzed, and his mental faculties somewhat disordered. The stupor in these cases is often very profound; often continuing many hours before the patient is roused so as to move. Sometimes this state is followed by a stage of delirium, often of the furious kind, or by a state resembling somnambulism. Recovery in such cases is generally doubtful. The symptoms of narcotism are apt to continue for a considerable length of time—indeed, longer than the effects of other narcotic poisons. There are cases on record where persons have continued five days in a state of coma before they expired.

During the last winter, we were called to visit a family consisting of a man and wife, and six children, all of whom were ill, but without knowing the cause. On entering the room, we perceived a strong smell of coal gas, and experienced a suffocating sensation after being in the room a short time. As a coal stove stood in the centre of the apartment, with very little draught, and no place for fresh air to enter except by the door, and as the whole cooking of the family was done on the same stove, it was very evident what was the cause of their illness. They all had an extremely sallow and even livid complexion, a wild expression of the eyes, feeble pulse, and cool skin, and complained of severe headache, want of appetite, nausea and sickness of the stomach, and a sense of faintness and general lassitude, disinclining them to motion. The mother had fainted several times in the course of the few preceding days, and once or twice fallen on the floor; while the husband, a mason by trade, had been unable to follow the business for some time previously. In connection with these symptoms, several of the children had a spasmodic cough a good deal resembling hooping cough. Being satisfied that the symptoms were all caused by breathing carbonic acid gas, we ordered the stove to be removed, and a fire kept in the chimney, which had been carefully closed by a fire-board, and in the course of a few days the family were all in the enjoyment of their usual health. This instance may serve to illustrate the influence of this poison when taken into

the system in a more gradual manner, and applied in a less intense degree; and we think there can be no doubt that a great proportion of the cases of chronic illness, of headaches, want of appetite, general debility, lowness of spirits, &c. in large cities, owe their origin to the same cause, and only require the breathing of a pure air for their effectual removal. And this will appear still more probable, when we consider the numerous causes constantly in operation in cities for the deterioration of the atmosphere and the production of carbonic acid gas; for symptoms entirely analogous to those already mentioned are produced by the gradual contamination of air in a confined apartment by respiration. Thus, out of 146 Englishmen who were imprisoned in the Black Hole at Calcutta, all but 22 perished in the course of a few hours, under the most dreadful of tortures, that of general suffocation; and a similar accident happened in London, in 1742, from the keeper of a public house having crammed 28 people into an apartment six feet square, and not quite six feet high, in consequence of which 4 persons were speedily suffocated. We can readily understand the cause of this deterioration, when we reflect that about 45,731 cubic inches of oxygen are consumed every 24 hours by an adult man, and 38,268 cubic inches of carbonic acid gas generated in the same time. The following results, which have a bearing on this subject, obtained by Dr. Southwood Smith from a very large number of facts and calculations, are deemed of sufficient importance to find a place here:—

1. The volume of air ordinarily present in the lungs is very nearly twelve pints.

2. The volume of air received by the lungs at an ordinary inspiration is one pint.

3. The volume of air expelled from the lungs at an ordinary expiration is a very little less than one pint.

4. Of the volume of air received by the lungs at one inspiration, only one-fourth part is decomposed at one action of the heart.

5. The fourth part of the volume of air received by the lungs at one inspiration, and decomposed at one action of the heart, is so decomposed in $\frac{5}{6}$ parts of one second of time.

6. The time in which a circuit of blood is performed is identical with the time in which the whole volume of air in the lungs is decomposed.

7. The whole volume of air decomposed in 24 hours is 221,-882 cubic inches, exactly 540 times the volume of the contents of the lungs; 160 seconds being also exactly $\frac{1}{540}$ part of the number of seconds in 24 hours.

8. The quantity of the blood that flows to the lungs, to be acted upon by the air at one action, is two ounces.

9. This quantity of blood is acted upon by the air in $\frac{5}{6}$ of one second of time.

10. One circuit of the blood is performed in 160 seconds of time: these circuits are performed every eight minutes; 540 circuits are performed in the 24 hours.

11. The quantity of blood in the whole body of the human adult is 24 lbs. avoirdupois, or 20 pints imperial measure.

12. In the space of 24 hours, 57 hogsheads of air flow to the lungs.

13. In the same space of time, 24 hogsheads of blood are presented in the lungs to this quantity of air.

14. In the mutual action that takes place between these quantities of air and blood, the air loses 15,757.9131, or 328$\frac{1}{2}$ ounces of oxygen, and the blood 10 ounces and 116 grains of carbon.

15. The blood, while circulating through the lungs, permanently retains and carries into the system, of oxygen 2,648,809 grains, and of azote 2,267,104 grains.

It has been a matter of wonder with the uninitiated how the atmosphere preserves its purity, while such a multitude of living beings are constantly consuming its oxygen, and replacing it with carbonic acid gas. The reason is, that plants and animals, the two great classes of the organic kingdom, produce directly opposite changes in the chemical constitution of the air: they are antagonistic forces. The carbonic acid produced by the animal is decomposed by the plant, which retains the carbon for its own growth and nourishment, and returns the oxygen to the air; while this is in its turn absorbed by the animal, who exhales the carbonic acid for the reäbsorption of the plant.

Thus plants and animals renovate the air for each other, and maintain it in a state of perpetual purity; for, although plants as well as animals absorb oxygen during the night, yet during the day they give off more than enough to compensate for that which is consumed during the absence of light. Plants thus improve the air, by the removal of carbonic acid, and by the renewal of oxygen, which is immediately applied to the use of man and animals, in quantity amply sufficient for the whole animal kingdom. A simple experiment, by Prof. Daubeney, shows with what rapidity this process is carried on. A quantity of leaves, about fifty in number, were enveloped in a jar of air; the surface of all the leaves, taken together, being estimated at about 300 square inches. By the action of these leaves on the carbonic acid introduced into the jar, there was added to the air contained in it no less than 26 cubic inches of oxygen. As there was reason to conclude that the evolution of oxygen, in the circumstances under which this experiment was performed, was considerably less than it would have been in the open air, several plants were introduced into the same jar of air in pretty quick succession: the amount of oxygen now evolved was increased from 21 to 39 per cent, and probably had not even then attained the limit to which the increase of this constituent might have been brought. From the proportions of the constituent elements of carbonic acid gas, it follows, that by the mere process of decomposition, out of every 11 grains of carbonic acid gas, 8 grains of oxygen must be liberated, 3 grains of carbon being retained by the plant, and consequently 8 grains of oxygen are restored to the atmosphere, less only by so much as the plant itself may absorb. We can thus form some idea of the production of oxygen by a large tree, under favorable circumstances, that is, when animal respiration and animal putrefaction present to it an abundant supply of carbonic acid on which to act. Thus does vegetable culture increase the healthiness of a country, and a previously healthy country would in all probability be rendered quite uninhabitable by the cessation of all cultivation; and thus is the life of plants closely connected with that of animals, in a most simple manner, and for a wise and sublime purpose.

"The presence of a rich and luxurious vegetation," says Liebeg, "may be conceived without the concurrence of animal life, but the existence of animals is undoubtedly dependent upon the life and development of plants. Plants not only afford the means of nutrition for the growth and continuance of animal organization, but they likewise furnish that which is essential for the support of the vital process of respiration; for, besides separating all noxious matters from the atmosphere, they are an inexhaustible source of pure oxygen, which supplies the loss which the air is constantly sustaining; animals, on the other hand, expire carbon, which plants inspire; and thus the composition of the medium in which both exist, namely, the atmosphere, is maintained constantly unchanged."

It has been objected to this, that towards the end of autumn, and through the winter and spring, the air in our climate must become impure, from the absence of leaves; that the oxygen must diminish and the carbon increase in the atmosphere. But, as Liebeg observes, the different parts of the atmosphere are constantly mixed together by the winds, which often move at the rate of from 60 to 100 miles an hour. There are, besides, the vast forests and savannas in tropical climates always luxuriant in vegetation, and the air from them passing often over the ocean and other large surfaces of water, arrives in an uncontaminated state. The storms and tempests which occur have also a salutary influence: by constant agitation and motion the equilibrium of the constituent parts of the atmosphere, and consequently its purity, is thus preserved. Thus, as Liebeg has observed, the proper, constant and inexhaustible sources of oxygen gas are the tropics and warm climates, where a sky, seldom clouded, permits the glowing rays of the sun to shine upon an immeasurably luxuriant vegetation. The temperate and cold zones, where artificial warmth must replace deficient heat of the sun, produce, on the contrary, carbonic acid in superabundance, which is expended in the nutrition of tropical plants. The same stream of air, which moves by the revolution of the air from the equator to the poles, brings to us in its passage from the equator the oxygen generated there, and carries away the carbonic acid formed during our winter.

It has been supposed that the quantity of carbonic acid in the atmosphere is not sufficient for the wants of vegetation on the surface of the earth; but Liebeg has shown that as a column of air, of 2216.66 lbs. weight, Hessian measure, rests upon every square foot of the surface of the earth, the thousandth part of this being carbonic acid, which contains upwards of 27 per cent of carbon, the atmosphere consequently contains 3000 billion lbs. of carbon—a quantity which amounts to more than the weight of all the plants, and of all the strata of mineral and brown coal upon the earth. This carbon is, of course, more than adequate to all the purposes for which it is required.

It appears from the experiments of Orfila, that the emanations from burning charcoal, when in a state of rapid ignition, consist of carbonic acid gas as the only foreign ingredient. A hundred parts of the air evolved are composed of 42 azote, 46 common air, and 12 carbonic acid; but when the charcoal burns faintly, 100 parts contain 52 of azote, 20 of common air, 14 of carbonic acid, and 14 of carburetted hydrogen. Christison has remarked that the vapors are the most dangerous in the latter state; for in countries where charcoal chaffers are much used for warming close chambers, it is found unsafe to close up the doors till the fuel is in a state of rapid ignition; and the experiments of Orfila show that a much larger proportion of the oxygen of the air passes through unconsumed than when combustion is dull. It is owing to this fact that the proportion of carbonic acid in a poisonous atmosphere is very small. Dr. Christison mentions the case of an attempt at suicide where the proportion was so small, that the people who entered the apartment found the air quite respirable, and the chaffer burning, although the person they sought was in a state of deep coma; and we have already stated that coma is rapidly induced when the air is pure enough to support the combustion of lights. The same writer makes an observation worthy of note, tending to explain the cause of the different effects of the poison on several individuals simultaneously, and to appearance alike exposed to it, viz. that in a close apartment the gas abounds most in the lowest part, by reason of its great density; but that where a current from without is directed through the room, as, for example, from

below a door towards a fire or stove, the situation where least effect is produced may be exactly that which in other circumstances is the most dangerous, namely, on the floor.

For the American Repertory.

BOARD AND TIMBER TABLE.

[Constructed upon the Author's Newly-invented System of constructing Mathematical Tables.]

This table shows the number of cubic feet contained in any given number of feet, running measure, not exceeding 17,000, and corresponding to timber of different sizes, from 4 to 19 inches square. It shows also the number of square feet contained in any given number of feet not exceeding 17,000, and corresponding to boards of different widths from 2 to 24 inches.

Description and application of the Table.

The numbers in the upper horizontal lines, commencing at 1000 and increasing upwards to 9000, express feet running measure either for boards or timber, the peculiar arrangement of which is such that the first mentioned number may be supposed to represent 1. 10. 100. 1000. &c. according as we use the 1 separately or in connection with one, two or three cyphers, which principle is common to each of the other numbers.

The numbers in the columns marked A express the width of boards in inches.

Given the lineal dimensions and number of feet, running measure, of a quantity of timber, to determine the number of cubic feet:

Rule.—Under the given number of feet in the upper line, and corresponding with the lineal dimensions, stand the wholes, and to the right the decimal parts. For example, if it were required to determine the number of cubic feet contained in 8000 feet of timber, running measure, 12 inches by 17, we have the result by a single inspection, since under 8000, and corresponding with 12×17, we have 11,333 whole feet, and to the right 33, which are hundredths, the whole may be represented as it stands in the table by prefixing the decimal point thus, 11333.33. [*See p.* 34 *for other examples.*]

LINEAR DIMENSIONS OF TIMBER IN INCHES.			1000	2000	3000	4000	5000	6000	7000	8000	9000	A
		4×4	11111	22222	33333	44444	55555	66666	77777	88888	99999	
8×2½	10×2	4×5	13889	27778	41667	55556	69444	83334	97223	111112	125000	
12×2	8×3	4×6	16667	33333	49999	66666	83333	99999	116666	133333	149999	2
	8×3½	4×7	19444	38888	58333	77778	97222	116667	136111	155555	174999	
		4×8	22222	44444	66666	88888	111111	133333	155555	177777	199999	
	10×2½	5×5	17361	34722	52083	69444	86806	104167	121528	138889	156250	
12×2½	12×2½	5×6	20833	41666	62500	83333	104165	124998	145833	166667	187499	
14×2½	10×3½	5×7	24306	48611	72917	97222	121528	145833	170139	194444	218749	
	10×4	5×8	27778	55556	83333	111111	138889	166667	194444	222222	250000	
	10×4½	5×9	31250	62500	93750	125000	156250	187500	218750	250000	281250	
		5×10	34722	69444	104167	138889	173611	208333	243056	277778	312500	3
9×4	12×3	6×6	25000	50000	75000	100000	125000	150000	175000	200000	225000	
14×3	12×3½	6×7	29167	58333	87500	116667	145833	175000	204167	233333	262500	
16×3	12×4	6×8	33333	66667	100000	133333	166667	200000	233333	266667	300000	4
18×3	12×4½	6×9	37500	75000	112500	150000	187500	225000	262500	300000	337500	
15×4	12×5	6×10	41667	83333	125000	166667	208333	250000	291667	333333	375000	5
22×3	12×5½	6×11	45833	91667	137500	183333	229167	275000	320833	366667	412500	
24×3	16×4½	6×12	50000	100000	150000	200000	250000	300000	350000	400000	450000	6
14×3½		7×7	34028	68056	102083	136111	170139	204167	238194	272222	306250	
16×3½	14×4	7×8	38889	77778	116667	155556	194444	233333	272222	311111	350000	
18×3½	14×4½	7×9	43756	87511	131266	175022	218778	262533	306289	350044	393800	
20×3½	14×5	7×10	48611	97222	145833	194444	243056	291667	340278	388889	437500	
22×3½	14×5½	7×11	53472	106944	160417	213889	267361	320833	374306	427778	481250	
24×3½	14×6	7×12	58333	116667	175000	233333	291667	350000	408333	466667	525000	7
26×3½	14×6½	7×13	63194	126399	189583	252798	315972	379167	442361	505596	568750	
		7×14	68056	136111	204167	272222	340278	408333	476389	544444	612500	
	16×4	8×8	44444	88888	133333	177777	222222	266667	311111	355555	400000	
18×4	16×4½	8×9	50000	100000	150000	200000	250000	300000	350000	400000	450000	
20×4	16×5	8×10	55556	111111	166667	222222	277778	333333	388889	444444	500000	

WIDTH OF BOARDS IN INCHES.

LINEAR DIMENSIONS OF TIMBER IN INCHES.			WIDTH OF BOARDS IN INCHES. 1000	2000	3000	4000	5000	6000	7000	8000	9000	A
22×4	16×5½	8×11	61111	122222	183333	244444	305556	366667	427778	488889	550000	
24×4	16×6	8×12	66667	133333	200000	266667	333333	400000	466667	533333	600000	8
26×4	16×6½	8×13	72222	144444	216667	288889	361111	433333	505556	577778	650000	
	16×7	8×14	77778	155556	233333	311111	388889	466667	544444	622222	700000	
	16×7½	8×15	83333	166667	250000	333333	416667	500000	583333	666667	750000	
		8×16	88889	177778	266667	355556	444444	533333	622222	711111	800000	
	18×4½	9×9	56250	112500	168750	225000	281250	337500	393750	450000	506250	
20×4½	18×5	9×10	62500	125000	187500	250000	312500	375000	437500	500000	562500	
22×4½	18×5½	9×11	68750	137500	206250	275000	343750	412500	481250	550000	618750	
24×4½	18×6	9×12	75000	150000	225000	300000	375000	450000	525000	600000	675000	9
26×4½	18×6½	9×13	81250	162500	243750	325000	406250	487500	568750	650000	731250	
	18×7	9×14	87500	175000	262500	350000	437500	525000	612500	700000	787500	
	18×7½	9×15	93750	187500	281250	375000	468750	562500	656250	750000	843750	
	18×8	9×16	100000	200000	300000	400000	500000	600000	700000	800000	900000	
	18×8½	9×17	106250	212500	318750	425000	531250	637500	743750	850000	956250	
	27×6	9×18	112500	225000	337500	450000	562500	675000	787500	900000	1012500	
12½×8	12×8½	10×10	69440	138889	208333	277778	347222	416667	486111	555556	625000	
22×5	20×5½	10×11	76389	152778	229167	305556	381944	458333	534722	611111	687500	
24×5	20×6	10×12	83333	166667	250000	333333	416667	500000	583333	666667	750000	10
26×5	20×6½	10×13	90278	180556	270833	361111	451389	541667	631944	722222	812500	
	20×7	10×14	97222	194444	291667	388889	486111	583333	680556	777778	875000	
12×12½	20×7½	10×15	104167	208333	312500	416667	520833	625000	729167	833333	937500	
	20×8	10×16	111111	222222	333333	444444	555556	666667	777778	888889	1000000	
	20×8½	10×17	118056	236111	354167	472222	590278	708333	826389	944444	1062500	
15×12	20×9	10×18	125000	250000	375000	500000	625000	750000	875000	1000000	1125000	
	20×9½	10×19	131944	263889	395833	527778	659722	791667	923611	1055556	1187500	
12½×16	25×8	10×20	138889	277778	416667	555556	694444	833333	972222	1111111	1250000	
22×5½		11×11	84028	168056	252083	336111	420139	504167	588194	672222	756250	
24×5½	22×6	11×12	91667	183333	275000	366667	458333	550000	641666	733333	825000	11

BOARD AND TIMBER TABLE.

WIDTH OF BOARDS IN INCHES.

LINEAR DIMENSIONS OF TIMBER IN INCHES.	11×13	11×14	11×15	11×16	11×17	11×18	11×19	11×20	12×12	12×13	12×14	12×15	12×16	12×17	12×18	12×19	12×20	12×21	12×22	12×23	12×24	13×13	13×14	13×15	13×16	13×17	13×18	13×19	13×20
	22×6¾	22×7	22×7¼	22×8	22×8¾	22×9	22×9½	22×10	24×6	24×6¾	24×7	24×7¼	24×8	24×8¾	24×9	24×9½	24×10	24×10½	24×11	24×11½		26×6½	26×7	26×7½	26×8	26×8½	26×9	26×9½	26×10
1000	99306	106944	114583	122222	129861	137500	145139	152778	100000	108333	116667	125000	133333	141667	150000	158333	166667	175000	183333	191667	200000	117361	126042	135278	144444	153472	162500	171528	180556
2000	198611	213889	229167	244444	259722	275000	290278	305556	200000	216667	233333	250000	266667	283333	300000	316667	333333	350000	366667	383333	400000	234722	252083	270556	288889	307222	325000	343056	361111
3000	297917	320833	343750	366667	389583	412500	435417	458333	300000	325000	350000	375000	400000	425000	450000	475000	500000	525000	550000	575000	600000	352083	378125	405833	433333	460417	487500	514583	541667
4000	397222	427778	458333	488889	519444	550000	580556	611111	400000	433333	466667	500000	533333	566667	600000	633333	666667	700000	733333	766667	800000	469444	504167	541111	577778	614444	650000	686667	723611
5000	496528	534722	572917	611111	649306	687500	725694	763889	500000	541667	583333	625000	666667	708333	750000	791667	833333	875000	916667	958333	1000000	586806	630208	676389	722222	768056	813889	859722	906250
6000	595833	641667	687500	733333	779167	825000	870833	916667	600000	650000	700000	750000	800000	850000	900000	950000	1000000	1050000	1100000	1150000	1200000	704167	756250	812500	866667	920833	975000	1029167	1083333
7000	695139	748611	802083	855556	909028	962500	1015972	1069444	700000	758333	816667	875000	933333	991667	1050000	1108333	1166667	1225000	1283333	1341667	1400000	821528	882292	947222	1011111	1076042	1140972	1205903	1270833
8000	794444	855556	916667	977778	1038889	1100000	1161111	1222222	800000	866667	933333	1000000	1066667	1133333	1200000	1266667	1333333	1400000	1466667	1533333	1600000	938889	1008333	1083333	1155556	1230556	1305556	1380556	1455556
9000	893750	962500	1031250	1100000	1168750	1237500	1306250	1375000	900000	975000	1050000	1125000	1200000	1275000	1350000	1425000	1500000	1575000	1650000	1725000	1800000	1056250	1134375	1218750	1300000	1383125	1466250	1549375	1632500
A	993056	1069444	1145833	1222222	1298611	1375000	1451389	1527778	1000000	1083333	1166667	1250000	1333333	1416667	1500000	1583333	1666667	1750000	1833333	1916667	2000000	1173611	1260417	1354167	1444444	1535278	1625000	1715278	1805556
12																													
13																													
14																													
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21																													
22																													
23																													
24																													

LINEAR DIMENSIONS OF TIMBER IN INCHES.			1000	2000	3000	4000	5000	6000	7000	8000	9000	Δ
	28×7	14×14	136111	272222	408333	544444	680555	816667	952778	1088889	1225000	
	28×7½	14×15	145833	291667	437500	583333	729167	875000	1020833	1166667	1312500	
	28×8	14×16	155556	311111	466667	622222	777778	933333	1088889	1244444	1400000	
	28×8½	14×17	165278	330556	495833	661111	826389	991667	1156944	1322222	1487500	
	28×9	14×18	175000	350000	525000	700000	875000	1050000	1225000	1400000	1575000	
	28×9½	14×19	184722	369444	554167	738889	923611	1108333	1293056	1477778	1662500	
	28×10	14×20	194444	388889	583333	777778	972222	1166667	1361111	1555556	1750000	
	30×7½	15×15	156250	312500	468750	625000	781250	937500	1093750	1250000	1406250	
	30×8	15×16	166667	333333	500000	666667	833333	1000000	1166667	1333333	1500000	
	30×8½	15×17	177083	354167	531250	708333	885417	1062500	1239583	1416667	1593750	
	30×9	15×18	187500	375000	562500	750000	937500	1125000	1312500	1500000	1687500	
	30×9½	15×19	197917	395833	593750	791667	989583	1187500	1385417	1583333	1781250	
	30×10	15×20	208333	416667	625000	833333	1041667	1250000	1458333	1666667	1875000	
		16×16	177778	355556	533333	711111	888889	1066667	1244444	1422222	1600000	
		16×17	188889	377778	566667	755556	944444	1133333	1322222	1511111	1700000	
		16×18	200000	400000	600000	800000	1000000	1200000	1400000	1600000	1800000	
		16×19	211111	422222	633333	844444	1055556	1266667	1477778	1688889	1900000	
		16×20	222222	444444	666667	888889	1111111	1333333	1555556	1777778	2000000	
		17×17	200694	401389	602083	802778	1003472	1204167	1404861	1605556	1806250	
		17×18	212500	425000	637500	850000	1062500	1275000	1487500	1700000	1912500	
		17×19	224306	448611	672917	897222	1121528	1345833	1570139	1794444	2018750	
		17×20	236111	472222	708333	944444	1180556	1416667	1652778	1888889	2125000	
		18×18	225000	450000	675000	900000	1125000	1350000	1575000	1800000	2025000	
		18×19	237500	475000	712500	950000	1187500	1425000	1662500	1900000	2137500	
		18×20	250000	500000	750000	1000000	1250000	1500000	1750000	2000000	2250000	
		19×19	250694	501389	752083	1002778	1253472	1504167	1754861	2005556	2256250	
		19×20	263889	527778	791667	1055556	1319444	1583333	1847222	2111111	2375000	
	25×16	20×20	277778	555556	833333	1111111	1388889	1666667	1944444	2222222	2500000	
		21×21	306250	612500	918750	1225000	1531250	1837500	2143750	2450000	2756250	

Example II. To determine the number of solid feet contained in 9000 running measure of timber 17×19 inches.

Solution. Corresponding with 17×19, and under 9000, stands 20187.50 feet, the answer.

[*Note.*—By placing upon this result the proper value, we have also the number of solid feet corresponding to 900, 90, 9, &c. linear feet. Thus in the table under 900, and corresponding with 17×19, we have 2018.750, which is equivalent to removing the decimal point in the above result one place to the left. In the same manner, under 90, and corresponding with 17×19, we have 201.8750, which is equivalent to removing the decimal point two places to the left; and in the same manner, the result corresponding to 9 is equivalent to a removal of the decimal point three places to the left.]

Example III. Required the number of cubic feet in a stick of timber 19×13 inches, and 90 feet long.

Solution. Under 90, and corresponding with 19×13 inches, stands 154.3750, the answer.

Example IV. To determine the number of cubic feet in 7580 feet running measure of timber, 17 by 18 inches:—

Corresponding with	17×18	and	under	7000,	stands	14875.
"	"	"	"	500,	"	1062.5
"	"	"	"	80,	"	170.
Their sum is						16107.5

which is the answer required.

BOARD MEASURE.

Example I. Required the number of square feet in 5000 feet running measure of boards 17 inches wide.

Solution. Corresponding with 17 in column A, and under 5000, stands 7083.33, the answer.

Example II. To determine the number of square feet contained in 16200 running measure of boards 19 inches wide:—

Corresponding with 19 in col. A,	under	9000,	stands	14250.
"	"	7000,	"	12666.66
"	"	200,	"	316.66
Their sum is				27233.33

which is the answer required.

As the given number could not be found in the upper line, I decomposed it, and operated with the numbers 9000, 8000 and 200, the reason of which will be perceived, since when added they produce the given number 16200. In operations of this kind we are not restricted to any particular numbers: it is only necessary to make use of those which, when added, afford a result equivalent to the given number. A little practice will render this mode of calculating very expeditious, insomuch that the results of double, triple, and in most cases quadruple inspections, can be obtained mentally.

J. A. POWERS, *Civil Engineer.*

No. 99 Reade Street, New-York.

For the American Repertory.

DR. HOOK'S UNIVERSAL JOINT.

Having paid some attention to this very ingenious contrivance—the origin of which, by the by, may be traced to a much more remote period than that at which Dr. Hook lived—I have much pleasure in answering the queries of your correspondent "W." In order to avoid confusion, and attain brevity, it will, however, be necessary to reverse the order in which these queries appear. Accordingly, I will commence with No. 5:—"Whether a *single joint* connecting two shafts, at a given angle with each other, produces an irregular motion in the shafts? and if so, whether *two joints*, connecting the two shafts by an intermediate one, will, by a counterbalancing action, rectify or neutralize the error, and give a regular motion at the two extremes?" The irregularity of motion attending the use of a single joint is very great. Supposing the moving shaft to be regular in its rotation, the motion of the second shaft will be twice accelerated and twice retarded during each revolution; and supposing that the centre lines of the two shafts intersect each other at an angle of 135°, the extreme change of velocity above and below that of the moving shaft will be as the sine of 45° to unit, or in the ratio of 70711 : 100000; and if the uniform velocity of the moving shaft be expressed by 100, the second shaft will, twice in each revolution, revolve at the rate of 100

+29.3=129.3, and twice during the same period at the rate of 100−29.3=70.7, thus producing a change of velocity in the second shaft in the proportion of 70.7 to 129.3 twice during each rotation! That such irregularity renders the use of a single joint practically useless, need not be urged. By introducing an intermediate shaft and two joints, provided they form equal angles, a *perfectly regular* motion will be imparted to the third shaft, although the great irregularity of the intermediate one remains the same.

That the irregularity of the motion will be effectually corrected by introducing a second joint, is evident; for if the curved arms of the intermediate shaft are fixed in the same plane, it follows that at every point of rotation they must both have the same relative position to the horizontal and vertical planes; and therefore, if the first and third shafts form equal angles to the intermediate one, their curved arms must also both have the same relative position to the vertical and horizontal planes, and also to each other, at every point of rotation; from which it becomes manifest that the uniformity of motion of the first shaft will be duly transmitted to the third shaft.

Ques. 4. "In what may principally be found the loss, if any, arising from an extreme deviation of the shaft from a straight line?" The loss here alluded to will be produced by the great irregularity in the motion of the intermediate shaft and its curved arms, the increased strain on the bearings occasioned twice in each revolution, when evidently the position of the curved arms is such that the power must be communicated by a foreshortened lever: some power will also be lost by increased friction in the joint, produced by increased motion.

Q. 3. "How much may the shafts be varied from a straight line without materially injuring the action of the joint?" The deviation from the straight line ought not to exceed 45°, but which will be found quite suffioient in practice, one joint being inadmissible, whilst two of that angle admits of the direction of the moving shaft being changed 90°.

Q. 2. "Whether it is durable, and not easily deranged, nor liable to get out of working order?" Experience in mechanics has amply proved that complication in arrangement and irregularity

of motion are ever attended with liability to get out of order, and rapid wear. Now, the two defects here alluded to are leading features in Hook's Universal Joint.

Q. 1. "Whether it can be advantageously employed to conduct the amount of power derived from a 25 or 30 horse engine?" Certainly not. Ordinary bevel wheels are not so costly, more compact, and less liable to get out of order. J. E.

QUICKSET HEDGES.

During the past month we sojourned for a few days in a part of the country where an unsuccessful attempt had been made to form quickset hedges. The interest for this branch of husbandry that the circumstance gave rise to in our mind, brought with it the recollection of some remarks upon the practicability of forming hedges with many of our native plants, made a few years since by a friend who has mingled with an ardent pursuit of graver sciences the pleasant one of horticulture. In compliance with a request that he would put to paper what we had before heard him express, he has furnished the following observations, which we have great pleasure in laying before the agricultural reader :—

"The importance of live hedges to many of our farmers who happen to live in certain districts—our western prairies, for instance—where timber is scarce, is quite apparent, and needs no array of words to enforce it. Those also who live in old settled districts, where there is no stone on the land to build permanent fences with, find the cost of 'post and rail' a very serious tax upon their industry. However tardy our farmers may be in commencing to plant hedges, it is hazarding little to say that, sooner or later, they must adopt them.

"The European hawthorn, or White Thorn, *Cratægus Oxyacantha*, is used in many parts of Europe for the purpose of forming live and durable fences: in this country it is found not to thrive well in dry, gravelly or sandy soils; it delights in a rich loam. We have several varieties of the hawthorn fit for hedges, indigenous in the United States: as the *Cratægus Cocci-*

nea, or Great American Hawthorn; *Cratægus Crus Galli*, or Cockspur Hawthorn—this variety is armed with very strong thorns, nearly two inches long and in shape like a cock's spur; it is considered by many as being well adapted for hedges, particularly in those sections where it grows naturally: *Cratægus Tomentosa*, or Woolly Leaved Hawthorn; *Cratægus Cordata*, or Maple Leaved Hawthorn; with many others, some of which are without spines, and consequently would not answer a good purpose for hedges. The seeds or haws vegetate the second spring after they are sown.

"We have the Hornbeam indigenous in the United States, and well adapted for this purpose: it is believed that the seeds do not vegetate till the second year after ripening. The Honey Locust, *Gleditsia Triacanthos*, is found to make an excellent fence. The seeds are sown early in spring, and they come up shortly after: they vegetate very freely. The Honey Locust can be propagated from cuttings: in one experiment nearly all grew; and in experiments with cuttings of different sizes, three fourths of the whole were found to take root and grow. It would appear that the Honey Locust is of easy propagation by seed or cuttings; and although a large tree when it has room to attain its full size, it bears dwarfing in a hedge very well. Several varieties of the hawthorn become, under favorable circumstances, small trees of 15 or 20 feet high, with quite a sizable trunk to correspond.

"Varieties of the Holly have been used for this purpose, and they are found to make a close and durable fence. The seeds of the native varieties can be obtained from the woods: like haws, they vegetate the second spring after ripening.

"Many other plants and shrubs might be named as having been used in various countries and places for this purpose; as the Crab, the Apple, the Beech, the Elm, the White Mulberry, the Yew, the Privet, the Black Thorn, the Elder, the Willow, and indeed many others, according to circumstances.

"Any further remarks would perhaps be misplaced here. I will therefore only add, that in selecting the plants proper for this purpose, it will be a good guide to observe what kinds are growing in the vicinity; what soil and situation each thrives

best in when growing in a wild, uncultivated state, and to copy nature as near as circumstances will permit."

In almost every experiment of any magnitude in this country, upon the formation of hedges, exotics have been tried instead of the more hardy native shrubs; it is not surprising, therefore, that they have produced such unsuccessful results.

[For the American Repertory.]

ON THE STEAM-ENGINE.

[CONTINUED FROM PAGE 270.]

Your correspondent "J. E." appears as unlucky as pertinacious in persisting that heat is latent in steam. Such opinions and such contrivances as his must ever terminate unfortunately —because heat is absolutely more free in steam and similar vapors (as of alcohol, &c.) than in any other known disposition or combination of heat with matter. For is it not well known that all combustible matters, all explosive compounds, may be exposed to any degree of cold without abstraction of any of their prodigious store of latent heat? while steam cannot exist for an instant in contact with any colder or cooler substance whatever, however little cooler that substance may be. How clear, then, the distinction—how immense, then, is the difference—between latent heat and the free heat in steam!

Again. The metals, earths, &c. require considerable time to part with their free heat to any colder substance in contact, as evidenced by the time required to lower the temperature of red-hot iron, &c. plunged into cold water, wherein steam is cooled quick as thought.

Your correspondent "J. E." after toiling vainly for months in contriving his memorable instrument to demonstrate that heat is so latent in steam as to be inappreciable to the thermometer and to the senses, has at length, though tardily, discovered the aforesaid contrivance was a miserable failure; and he will soon perceive he has only wasted more time in tinkering it than he did in its original construction—all which he might and ought to have foreseen, from the notice we condescended to give it at page 23, vol. iii. But despising our kind information, he has

wasted immense mental toil, to please himself with a chimera, and expects your readers must be as delighted as himself at accomplishing this mighty matter within one year from its conception, and he can neither conceal his joy nor the magnitude of his triumph alike over us and reason and common sense.

This undefinable and therefore hitherto nameless performance, wonderful to relate, when placed in abler hands (like a chronometer in the hands of an astronomer) will prove matters far beyond the ken or comprehension of the inventor—just as readily, just as clearly as did its imperfect predecessor.

For what purpose is this instrument contrived but to prove that heat becomes latent in steam during the continued formation of steam, because the heat is then imperceptible to the thermometer and insensible to the touch? Now, then, if heat is imperceptible to the thermometer during the ascent of the piston in the cylinder, will not the heat become sensible to the thermometer, the formation of steam being uninterrupted, if the ascent of the piston is only interrupted for an instant? and just as long as the ascent of the piston is prevented will the mercury rise in the thermometer, and thus prove beyond doubt or question that heat does not become latent during the formation of steam in this superlative contrivance.

Should this second failure of his exquisite fail to convince him (as it probably may) that heat in steam is inappreciable to the senses, we here offer him ample means for a convincing experiment, free, gratis, for nothing but the love of truth, and to free him from an error that would be considered ridiculous in a stoker.

We have attached a small steam pipe to a boiler supplied with steam, the pipe extending to and terminated by a stopcock, in a cool apartment, in which, at his leisure, he can test the truth of his assertion. For the mere immersion of a finger in a small stream of genuine steam, for such a period as may be agreeable, pleasant and delightful, and convincing to any scientific friends, who cannot fail to be convinced by this his practical demonstration, however doubtful they may have been of his oft repeated theoretical asseverations, as each and all may embrace the same happy opportunity of immersing a finger in

steam in which the heat is so latent as to be imperceptible to the acute intellect of "J. E."

Though "J. E." complains, and so piteously too, of the severity of our method of comparing theories with facts, yet we can imagine no proceeding either more useful or promising more success than the one we have hitherto adopted, nor that would be more extensively or generally beneficial to mankind, were the same severe test applied to every theory in existence.

To show how much assurance and pretension is required, and and how little real knowledge is wanted, to broach, to support, and to scientifically maintain a plausible theory, contrary to reason and to common sense, we have only to imagine some writer (desirous to shine, regardless of truth) to declare that alcohol also becomes latent when mixed with water; and as he can prove this sober position just as fully and just as truly as "J. E." has endeavored to prove that heat is latent in steam, he might and ought to be considered as sound a philosopher as "J. E." for the attempt.

For if a hydrometer were placed in any determinate admixture of alcohol and water, that instrument will indicate the specific gravity or intensity only of the mixture; and however numerous or great may be successive additions of the same determinate admixture of alcohol and water to the first portion of the mixture already tested by the hydrometer, the instrument will still continue to indicate the same specific gravity or intensity only in the larger quantity of fluid. Hence, according to "J. E." the additional quantity of alcohol, however great, is latent or hidden or imperceptible, because it is imperceptible to the hydrometer, which is manifestly absurd.

Now these very small matters, which have so puzzled and continue to puzzle "J. E." arise solely from his contracted views of the very limited powers of all thermometers, hydrometers, and all other meters, each being alike and alone a measure of some singular property. Thus the thermometer is a sole measure of the intensity of heat, the hydrometer a sole measure of specific gravity; and neither of extent, of quantity, or capacity: to expect more would be as unreasonable as to expect a common rule to measure heat or specific gravity; and all

the miscalculations of "J. E." have arisen from his want of knowledge of the real nature or properties of the tools he works with.

For all the foregoing errors, defective conception or inveterate prejudices may be pleaded in excuse: for the wilful and gross misstatements we have next to notice, we can find no excuse.

We had stated at page 413 *et seq.* vol. ii, that the fuel in the Great Western was fully twice as efficacious as that in the North America, and then gave two detailed and distinct statements in proof of our assertion.

At page 32, vol. iii. "J. E." observed upon our statements, that in our calculations, we had rightly assumed the respective powers required to propel the vessels at different velocities, was as the square of the velocities of the vessels; and the rule we had adopted was in general use, and correct.

Yet at page 33 he stated the cube of the velocities was required, and not only ridiculed our calculation, but curiously enough, his own previous approval thereof on the preceding page.

At page 263 et seq. we animadverted on this inconsistency of "J. E." as unaccountable and irrational, and produced an experiment with two model boats, which proved that our calculation and the first assertion of "J. E." were correct, and that his second assertion was wrong and utterly unfounded.

Notwithstanding this, "J. E." threatens at page 349, vol. ii. to disprove all our calculations, which boast being in the nature of things impossible, he does such a puerile thing instead, that would be incredible on any evidence but his own.

First he has the hardihood to deny that we proved by our model boats that four times the power was required for double speed, and at page 50 ridicules us for saying that double weight only was employed to produce double speed, while the very words we used at page 264 were "the double weight descended also to double depth, and it is evident four times the power was expended in drawing the second boat through a double space in the same time."

By thus quoting but a portion of a sentence only, and by omitting the remainder, he evidently makes a wilful misstatement of a plain and positive fact, that could not have been supposed possible in any inquiry after truth.

Secondly, he proceeds—"it would be waste of time to prove what was taught in common schools centuries ago," and proceeds to state in substance "the resistance to similar bodies in motion in the same fluid, will be as the square of the velocities of the bodies."

Now when at page 32 he stated the rule was as the square of the velocity, and then at page 33 ridiculed us for so stating it, and asserting the rule was the cube of the velocity, and now again at page 350 after vulgarly miscalling our correct statement ignorant nonsense, then and there stating by his assertions and rules that we are and ever were correct and consistent, we are constrained to enquire, whether such conduct is or can be consonant with sanity?

"J. E." is alike unfortunate in decrying and ridiculing our model boats as useless 'toys' when compared with the expensive experiments of Colonel Beaufoy, page 351, in which it must be observed no one figure was boat-shaped, nor that any of the 72 experiments there paraded gave more than approximate confirmations of the general rule, while our inexpensive 'toy' gave a full and exact confirmation.

This contemptuous sneer at our useful 'toy' by the author of the Ericssonum was peculiarly inappropriate, because our 'toy' realized a great, a correct result, with little means. Now the greatest honor of the greatest philosopher is, that he discovered the laws of light by a few little soap bubbles and an inconsiderable piece of glass, and the laws of gravitation by the fall of an apple.

We will now proceed to test the truth of "J. E.'s" assertion, reiterated ad nauseam, that the effect of fuel was greater in the high-pressure North American than in the low-pressure Great Western.

We gave two distinct rules for testing this fact, the first embracing a variety of circumstances, the second comprising but two: namely, the speed and displacement of each vessel in smooth water; now as this latter rule allows no misstatement by a quibbling adversary, we shall prefer it for discussing this very important question.

First.—We shall adhere to our former expressed opinion, that

the heating power of the different fuels in both vessels was nearly equal, although late experiments by Dr. Fyfe, seem to shew that we must have overrated the effect of bituminous coal in the narration of circumstances which occurred to our observation nearly half a century ago, as any error thus made will be in favor of the North American.

Secondly we find in the report of the Institution of Civil Engineers, in the Civil Engineers' Journal, Feb. 9th, a statement of Mr. Field, the able manufacturer of the engines of the Great Western, that the ascertained speed of that vessel in smooth water was $13\frac{8}{10}$ miles per hour.

Thirdly.—We are informed by Mr. Roberts, superintending engineer on board the Great Western, that at sea, in smooth water, under bare poles, towards the termination of a voyage, draft of water 14 feet, the speed of the vessel is 12 miles per hour; and this cannot be questioned, when it is considered the average speed of the vessel has much exceeded nine miles per hour during the whole of late voyages.

Fourthly.—Let us first compare the effect of fuel by the proportionate law we found experimentally with our 'toy,' and by the proportionate immersed midship sections of the vessels only (and which will be hereafter found very inadequate to show all the real superiority of the Great Western.)

Fifthly.—As the facts we are about to elicit will appear so astonishing, we will make every possible allowance to place our statements beyond doubt or contradiction from any sane and competent person whatever. We will, therefore, assume the speed of the North America 15 miles, instead of 14.5 her actual; the speed of the Great Western 13 miles, instead of 13.8 her actual. Then if, according to the rule of velocities and midship section, $25.0\times4.0\times15^2=22.500$ represents the proportionate effect of fuel in the North America, $33.5\times12\times13^2=67.938$ will represent the effect of fuel in the Great Western in smooth water, and $33.5\times14\times12^2=67.536$ will represent the effect of fuel in the Great Western at sea under bare poles.

Thus it now appears the fuel in the Great Western is thrice as effective as the fuel in the North America, instead of only twice, as we previously stated, and after such enormous allow-

ances are made to render the statement incontrovertible, and for which there exists no necessity whatever.

To show the utter hopelessness of farther dispute on the part of "J. E." we annex (needless as it is for any sober purpose,) the comparative effect of cubing the velocities, as at page 33 he so positively expressed was the rule, and which from his mode of philosophizing, he is as likely to repeat, could such a vagary extricate him from his woful situation.

Now if $4\times25\times15^3=337500$ were assumed as the effect of fuel in the North America, then $33.5\times12\times13^3=883194$ will represent the different proportional effects of fuel in the Great Western, which is more than 2.6 times the effect of fuel in the North America, by this calculation and all the advantages in her favor, as previously stated.

But our readers are not to consider these results as the full extent of the difference of effect of fuel as yet before them, as the midship sections afford but a very inadequate representation of the true effect. To show this fully, will require the details of other experiments with our 'toy,' which is at present as needless as inconvenient, for we have furnished sufficient matter for present contemplation by the magnitude and importance of the 'facts' produced. † †

MONTHLY RECORD.

Mathematical Tables.—The table upon board and timber measure presented in this number is calculated upon a new system, that admits of very great condensation, and makes the table more easy of reference. A table equally comprehensive calculated upon the old system would, in its most condensed form, fill 12 pages, or three times as many as the present one, while it might and probably would be made to occupy forty or fifty pages, or perhaps would be extended to hundreds.

Various other tables have been constructed upon the new system, by the inventor Mr. Powers, as—

A set of tables embracing Simple Interest, Discount, and Compound Interest at 6 and 7 per cent. Commission, Brokerage, Insurance, Chronometrical tables, &c. &c. A set of Trav-

erse and other tables required in navigation and inland surveying. A collection of annuity tables, a set of tables for the use of printers, &c. &c. These tables will all soon be published, either in chart or pamphlet form.

"The Goodwins, I think they call the place—a very dangerous flat, and fatal, where the carcases of many a tall ship lie buried."—*Merchant of Venice.*

New Lighthouse.—We learn from the last English magazines received that the construction of a lighthouse upon the Goodwin Sands has been undertaken by a private association of persons —underwriters, we presume. So energetic are the measures adopted, that by the close of the present season the work will be above highwater mark. The architect obtains a foundation for his structure by sinking iron *caissons* of 30 to 50 feet diameter, inside of which he excavates the sand down to the chalk rock lying underneath it. The *caissons* will then be filled with cements and masonry, affording a firm base for the tower, which will be circular, and 140 feet high. The only beacon that has hitherto guarded the mariner against these dangerous shoals is a floating light.

Galvanic Precipitation.—An engraver of Geneva has applied M. de la Rive's process of gilding by galvanism to aqua fortis engraving, He precipitates upon the copper plate a coating of gold, which takes the place of an etching ground: the drawing is made upon the gold and removed with the burin in the usual way, leaving the copper exposed to the action of the aqua fortis. Plates so prepared, owing to the permanency of the gilding, except where it is removed by the tool, are said to have the further advantage of rendering after additions or corrections more easy: it may be so, but we cannot see why.

Vive la France.—Those utilitarians who hold the Fine Arts in contempt will be disappointed to learn that an *useful* application of portrait painting as they would deem it, has been made in France. A leader in one of the late conspiracies against the King was unexpectedly shown the portraits of a number of suspected persons, and by watching his countenance as each was presented to him, it is said important discoveries as to the other conspirators were made.

NOTICES OF NEW PUBLICATIONS.

The New York Medical Gazette—Wm. C. Roberts, M. D. *Editor, is published every Wednesday, by Uriah Turner, M. D. No.* 8 *Park Place.*

This Journal we surmise is one of several good results that have grown, or are to grow out of the laudable rivalry between the Medical Schools now established in this city, about which, by the way, we are sorry to see certain partisans making themselves very ridiculous in some of the daily papers, and manifesting much more feeling than those more immediately interested in the matter do, as we happen to know—but to to the Medical Gazette. It has been in existence about one month, and already its pages are enriched by contributions from some of the ablest of our medical writers. The reproach that New York cannot support a journal of medicine, will henceforth have no meaning—we confidently believe the present one will receive the encouragement it deserves, and not be suffered to die the death of its predecessors.

The American Magazine and Repository of Useful Literature.—This is the title of a new periodical devoted to the various branches of useful knowledge, striking points in history, biography, natural history, scenery, and indeed to almost every department in literature of general interest except "tales of fiction and romance, political discussions and sectarian controversies." It is an offering to the mind not diseased by sickly sentiment, warped by party zeal, or blinded by bigotry; and if the number before us be an earnest of its future excellence we welcome it into the field with hearty warmth. Israel Post, 88 Bowery, is the agent for this city.

MISCELLANEOUS.

FOREIGN.

Calotype.—It has been known for some time, that Mr. Fox Talbot, in the progress of his experiments to render more perfect the art of photogenic drawing, had discovered a means by which paper could be made far more sensitive to light than heretofore. The impressions, however, so quickly obtained by this method, are in the first instance *invisible*, but by a process similar to the first, they are made to appear with even greater power than in ordinary photogenic drawing. On Thursday evening, June 10, Mr. Talbot read a paper at the Royal Society, in which he described the new process, called, for distinction's sake, *Calotype;* and as the subject is one of general interest, we shall here briefly describe it:—The paper is covered with iodide of silver, by washing it successively with nitrate of silver and iodide of potassium. Afterwards it is washed over with gallo-nitrate of silver, the greater part of which is removed by immersion in water, but enough adheres to render the paper exceedingly sensitive to light. The paper is then dried, and placed in the camera obscura, and the image of a building, or other object, is generally obtained in less than a minute. This image, however, is usually quite invisible; and the mode of rendering it visible (which is the most curious part of the Calotype process,) consists in washing it again with gallo-nitrate of silver and then gently warming it, which generally causes the appearance of the picture with great force and vivacity in the space of a minute or less. The gallo-nitrate of silver is formed simply by mixing solutions of nitrate of silver and

gallic acid. The operation requires to be executed with great care and precision, but is not difficult in other respects. The theory of the process remains, at present, unexplained. Atheneum.

Monument in Westphalia—A remarkable monumental structure is at present raising, or about to be raised, in that part of Westphalia where Arminius overthrew the Roman legions, commanded by Varus, to commemorate that event. The monument is to consist of a statue of the German hero, similar to the many images which may still be seen under the name of "Ermin of Sæulen," in various parts of Germany, and which became, in the early periods of the Christian Era, objects of idolatrous worship. The statue is to be of copper, 42 feet high, and to the point of the uplifted sword 75 feet! It is to be placed on a circular temple 90 feet in height, on the top of the hill Teut, in Teutoberger forest. The monument promises to do honor to the German art, and the idea of erecting such a work is a proof of the patriotic feelings of the Germans. The expenses are to be defrayed by subscription, and all the sovereigns of Germany have contributed. Lond. Civ. Eng. & Arch. Jour.

Stupendous Column.—Mr. T. L. Donaldson, Fellow of the Royal Institute of British Architects, read before that society in June last a description of the column erected at Petersburgh in honor of the late Emperor Alexander. The construction of this monument rivals that of the best ages of antiquity. The shaft is monolithic, of polished granite, 84 feet in length. The pedestal is also a single block of the same material, and so carefully has the durability of the work been considered, that two vast masses were successively rejected after they had been extricated from the quarry as not being sufficiently perfect. Possessed as we are in Great Britain of granite quarries capable of supplying stones of almost unlimited dimensions, it is to be regretted that such an example should be lost upon the directors of our public works. Unfortunately the example is likely to excite nothing but feelings of horror and contempt for so outrageous a dereliction of the principles of economy! Ib.

An Unoxydizable Metal for Castings.—This alloy has the fracture and aspect of ordinary zinc, but possesses remarkable properties which will render it valuable in the arts. It is as hard as copper or iron; it possesses more tenacity than soft brass castings, it may be turned, filed, or bored, as well as those metals, it does not adhere to the metallic moulds in which it is run, and may be kept in moist air without rusting, or in the least losing its metallic lustre. Such an alloy will be of great utility in the manufacture of machinery, and as moreover, it takes with great facility any of the bronze colors which it may be desired to give it, either by covering it with metallic precipitates, or by developing the copper which it contains, it will be eminently suitable to be employed in casting statues, vases, and other objects designed to ornament public monuments exposed in the open air. It will have, moreover, the advantage over bronze, of costing less.

It is prepared by casting together with proper precautions, zinc, copper, and cast-iron. It contains 10 per cent of copper, and 10 per cent of iron. Trans. for the Franklin Journal from Annales des Mines.

Locomotive Excavator.—This French machine is stated to be the invention of M. Gervais, of Caen. The trial of the apparatus was made in the presence of a committee of the Society of Emulation at Rouen, and of many of the distinguished residents of the town, and the result is said to have left no doubt of the possibility of making excavations by the power of steam. It is said to be particularly applicable in digging canals, and making the excavations for railways. The apparatus is placed on a large heavy kind of carriage, in the fore part of which there is a steam engine of six horse power, with oscillating cylinders and a tubular boiler, which works the machine, and also turns the two fore wheels very slowly, so that the whole is gradually moved forward as the work progresses, large pieces of wood being laid down to form temporary rails, over which the machine is propelled. Towards the back of the machine there are two machines similar to dredging machines, which raise the earth that has been dug out, and deposit it in a horizontal endless chain of buckets, which carry the excavated earth beyond the limits of the trench, and there deposit it, forming an even and regular bank on each side. The excavating apparatus is placed about the middle of the carriage. It consists of four iron shafts, parallel to each other and equi-distant, the whole four having their axis in the same plane, and forming an angle of fifty degreess to the horizon, the incline being towards the back of the machine. Each shaft has attached to it five double arms, equi-distant from the bottom to the top, and each arm is furnished with a spade-shaped tool. These shafts, therefore, present forty spades working at different heights, which dig a ditch nearly three metres in width, and upwards of one metre in depth. Each of these excavating tools, when in action, strikes against the earth ten times in a minute. These revolving excavating shafts are put in motion by the steam-engine, and the action of the engine is so regulated that the whole machine progresses at the rate of about twelve metres in an hour. The whole of the machinery, including the carriage, weighs about 24,000 kilogrammes, or 15 tons. When, owing to the nature of the soil or the presence of large stones, the action of the tools is resisted, the locomotion is stopped, and the whole apparatus is made to back, so as to enable men to remove the obstruction. The trenches dug by this machine are very exact, the sides are perpendicular and smooth, and the earth thrown out forms on each side a regular embankment. A machine of this kind was some time since shown by M. Gervais to the French Academy of Sciences, on which they reported very favorably; but it was not provided with the means of locomotion, nor was it on so large a scale as the machine at Rouen. Inventors' Ad.

Newspapers.—It was stated at a recent meeting of the Statistical Society of London, that the United States have more newspapers than the whole 190 millions of inhabitants of Europe.

Paper from Asparagus.—We have pleasure in hearing that one of the most famous paper manufacturers, M. Dierecks, of Ghent, has collected all the stalks of the asparagus that come from the tables d'hôte and great houses of the town, in order to convert them into paper. Every evening two or three loads of these fibrous stalks are carried to

the rolling mill, and thence to the stamping machine, which triturates them in the course of a few hours. The kind of paste which is thus produced does not require bleaching. It is put into tubs, and taken to the paper-making machine, from which it issues converted into excellent white paper, the expense of which is not half that of paper made from rags. Asparagus mixed with the pulp of beet-root produces a kind of paper which is even superior. Le Fanal.

Improvements in Printing Cotton, Silks, &c.—These improvements relate, firstly to the mordants used in dyeing printed fabrics; and, secondly, to the mode of raising or fixing the colors in printed pieces.

The mordants for various colors are as follows:—

For standard Yellow.—3lbs. nitrate of lead, 3lbs. sugar of lead, dissolved in one gallon of boiling water, with the usual thickening.

For Blue.—30 gallons of water, 4 lbs. indigo in powder, 6lbs. of copperas, and 10lbs. of slaked lime in powder; to 15 gallons of the clear liquor thus produced, 2 quarts of liquid muriate of tin are added, and the mixture strained through flannel to a thick pulp; to 3 quarts of this pulp add 1 quart of gum water, 21lbs. of calcined farina, and 4 ounces of muriate of tin in crystals.

For Green.—5lbs. of sugar of lead are dissolved in 1 pint of acetic acid, in an earthen vessel, in a hot water-bath; when cool, add 4 quarts of the pulp above mentioned, with 2½lbs. of calcined farina, and 4 ounces of crystalized muriate of tin.

For Olive.—Mix 15 quarts of the standard yellow liquor with 5 quarts of gum water, 1 quart of iron liquor, and any usual thickening.

For standard Red.—Dissolve 4lbs. of alum in 1 gallon of boiling water, and add 2½lbs. of each, white and brown sugar of lead, and thicken with calcined farina.

For Orange.—To 2 quarts of the standard yellow liquor add 1 quart of the standard red, and thicken with 2lbs. of calcined farina.

For Buff.—To 3½ quarts of the standard yellow liquor add 1 quart of the standard red, and thicken with 3lbs. calcined farina.

For Brown.—To 14 quarts of the buff liquor add one quart of iron liquor, and thicken with calcined farina.

For Drab.—To 8 quarts of the standard yellow liquor add 12 quarts of gum water, and one quart of iron liquor, and thicken as last.

For strong or deep Red.—To 3½lbs. of alum dissolved in 1 gallon of boiling water, add 1½lb. of each white and brown sugar of lead; to a quart of this mixture, add 6 ounces of calcined farina, and when cold 1¾ ounce of crystalized muriate of tin.

For pale Red or Pink.—To 8lbs. of alum in 2 gallons of boiling water, add 3lbs. of carbonate of soda, and 2lbs. of sugar of lead; to every quart of this mixture, 3 quarts of gum water are to be added.

For Black.—To 1½ quart of vinegar add 1 quart of iron liquor, and thicken with 1½lb. of flour, starch, or calcined farina.

For Purple or Lilac.—To 1 quart of iron liquor add 6 quarts of vinegar and 10 quarts of water, and thicken as last.

For raising or fixing these colors, 100lbs. of carbonate of soda are dissolved in warm water, to which, when cold, 150lbs. of cow-dung are added, and the mixture allowed to stand 24 hours. Or 50lbs. of carbon-

nate of soda dissolved in warm water, are mixed with from 20 to 25lbs. of bi-carbonate of soda and 50lbs of cow-dung. Any other substance containing a sufficient quantity of ammonia may be used instead of the cow-dung.

The raising of the colors is effected by passing the printed fabrics through either of the foregoing mixtures. Lond. Mechanics' Mag.

Suicidal powers of Luidia.—The wonderful power which the star-fish possesses, not merely of casting away his arms entire, but of breaking them voluntarily into little pieces with great rapidity, approximates it to the Ophiuræ. This faculty renders the preservation of a perfect specimen a very difficult matter. The first time I ever took one of these creatures I succeeded in getting it into the boat entire. Never having seen one before, and quite unconscious of its suicidal powers, I spread it on the rowing-bench, the better to admire its form and colors. On attempting to remove it for preservation, to my horror and disappointment, I found only an assemblage of rejected members. My conservative endeavors were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by an armless disc and a discless arm. Next time I went to dredge on the same spot, determined not to be cheated out of a specimen in such a way a second time, I brought with me a bucket of cold fresh water, to which article star-fishes have a great antipathy. As I expected a luidia came up in the dredge, a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce luidia to the purer element. Whether the cold air was too much for him or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision. Young specimens are by no means so fragile as those full-grown; and the five-armed variety seems less brittle than those with seven arms. Like other starfishes, it has power of reproducing its arms. Forbes.

Tests for Ultramarine.—There has been lately introduced into England from Germany, a very beautiful chemical manufacture, the compound tints of which are nearly as brilliant as those of the real ultramarine. The only difference is, that all the tints produced by mixing the German blue with white-lead have a lilac hue, which those produced by the real have not. In a matter of such nice distinctions as exist between the real and factitious ultra-marines, and where the great price of the former offers strong temptation to adulteration, or the substitution of a spurious article, it now very nearly concerns the artist to be able to determine the quality of the color he employs. Real ultra-marine when exposed to a dull red heat, changes its color but very little; while the factitious becomes much more grey; and if then ground it will be found to have lost its lively and beautiful color, giving only a dull blue, or a grey tint with a tinge of purple. If a small portion of real ultra-

marine be placed in an earthenware vessel, and a little nitric acid be poured over it, it gradually loses its blue tint, and a dirty white gelatinous residuum only remains.

If the German ultra-marines be treated in the same way, the blue color disappears in a similar manner; but after a while, there appears on the residuum a pinky or flesh-colored stain. The French ultra-marine, although much more permanent than the German, is more readily distinguishable from the real. In its dry state it is considerably darker, and heavier in its appearance. On the application of nitric acid, the same result is not observable as in similarly treating genuine ultra-marine; but a very remarkable effervescence takes place, evolving red fumes in abundance. These appearances particularly distinguish the French factitious ultra-marines from the genuine extract of lapis lazuli. When mixed with white-lead, the French composition affords tints nearer in hue to the real ultra-marine than those of the German, and with less of the lilac tint; but as it has not the luminous quality of the latter, the artist is in less danger of being deceived. The French blue does not change on being exposed to a red heat so much as the German; but it loses its fine tint and assumes that of Prussian blue, but without its strength or intensity. The factitious ultra-marines work and wash well in water color; and although in this respect they have an advantage over the real, which can never be divested of its granulous quality; yet this serves to distinguish the real, of so many guineas per ounce, from the factitious, which ought only to be so many shillings.

Lond. Art-Union.

Thorwaldsen.—In pursuance of a resolution of the inhabitants of Frankfort to erect a statue in honor of Goethe, Thorwaldsen was requested to send in a design. In compliance with the requisition he sent in two, both of which have been rejected, and it is now supposed that the execution of the work will be entrusted to Launitz, whose statue of Guttenberg is so much admired. Lond. Art-Union

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Musical Intelligence.—A great singing festival has just been held at Ludwigsburg (Louisburg), at which seventy-four singing societies, comprising 2,300 singers, from the towns and villages of the neighborhood, assembled. The North Germans will also be astir next month, for the Hamburg Festival, at which, among other attractions, M. Liszt has been engaged to appear. But the greatest piece of foreign musical news during the week, figures in the Belgian journals, which announce the invention, by M. Sax, of a steam organ—a monster-instrument, with vibrating plates, (huge steel bars, to which immense pressure alone can communicate vibration,) capable of being heard over a whole province!

Sir Joshua Reynolds.—Reynolds is considered by the academicians as the founder of the British school of painting. To him they attribute the introduction of all that is vivid in color, or lofty in character. He did much, and was one of the first who, by his gentle manners and probity, conferred dignity upon the profession of painter in our island. The freedom, ease, and breadth of coloring of his portraits, are only equalled by the individuality of character which he gave to all he touched. They contain whatever was manly in man; or gentle and lovely in wo-

man. The happy looks and joyous eyes of his children, are not more natural than the employments which he has assigned to them; they fondle birds, gather flowers, and chase butterflies, with a grace which it is vain to seek in the earlier artists of the land. His historical pictures are less happy; his imagination was of a humble order; he could not image out a virtue from reflection alone; nor impress the patriotic costume of thoughts on his groups from the poet. Lond. Sat. Jour.

Roses of Ghazeepore.—In the beginning of July we emarked on the Ganges, now full to the brim. If any person wishes to luxuriate among roses, let him repair to Ghazeepore, where the whole country, for some hundred or two square miles, is thickly covered with them. Rose-water and the exquisite attar of roses are, consequently cheaper here than in any other part of India; though the latter, when genuine, must always be a most expensive article, from the enormous consumption of roses in its preparation. It takes a prodigious quantity of the petals to make an ounce of attar; and to produce a great bottle would require, I suppose, a heap about as big as St. Paul's. Lond. Gard. Mag.

Climate of Norway.—The following is a translated extract from a letter of the German traveller, Russegger, who, since his return from Egypt, has visited Norway, and is we believe, about to publish a work on the geological and natural phenomena of that interesting country:—"The coast of Norway, as regards climate and atmospherical phenomena, is undoubtedly one of the most striking regions in the world. We were at this moment precisely in the same degree of latitude as the northernmost part of Iceland, and still corn grows here. Nay, more, it is the case as far as 70° latitude. At Alten, which lies higher than the most northern colonies of Greenland, one sees corn cultivated, and thick woods of larch. How is it with the other parts of the earth lying in these latitudes? with Asia and America? They are congealed with eternal frost and snow, and uninhabitable by the human race. In Norway, in the 71st degree of latitude, stands a town of 600 inhabitants, Hammerfest, being the most northerly town on the face of the globe. Again, in the 70th degree lie the extensive copper works of Kaaffiord, which, excepting the coal mines of Spitzbergen, are the northernmost underground works in existence. Even at the North Cape human beings are found residing. Whilst Russia, in the winter, possesses not a single haven that is not blocked up, while the Baltic and Cattegat are frozen over, and Iceland completely girt in with ice, in not a single port of Norway, on the contrary, is ice to be seen; at Roeraas, in the winter, the quicksilver often freezes, whilst in the Alps it is often at −24° R., in the African deserts, as I have myself experienced, it stands frequently in the morning at zero, here in Norway, at Tromöse, between latitudes 69° and 70°, the thermometer rarely falls during the winter lower than 12° R.; and even within the Arctic circle the temperature is seldom lower than +2° or 1° Reaumur." Having stated these singular facts, our traveller essays to explain the cause of the the Scandinavian coast being thus apparently exempted from the general law of nature, "that warmth decreases in proportion as we approach the poles." "Is it," he says, "from the fact of the coast being shelter-

ed from the winds?—this is certainly not the case, as not unfrequently it lies open to nearly all the winds from the northern hemisphere—or is it to be attributed to a warm current of air flowing from the equator to the pole, as some have supposed? No; all observations that have hitherto been made are against such a supposition. A continual elevation process in the earth, such as can be proved to exist in Sweden, is also unquestionably at work along the coasts of Norway. A marine alluvial stratum is perceptible along the coast from Finland to the North Cape, and extraordinary old water-marks are visible 500 feet above the present sea level, both at Drontheim and elsewhere. It is obvious, therefore, that these points must formerly have been covered by the sea. An elevation-process, I say, of this nature, together with the necessarily concomitant development of subterranean heat, is nearly the only solution of this important phenomenon." London Atheneum.

Worms destroying Ships.—The brig St. Nicholas, but very lately built at Taganrog, and now at anchor at Salta, was fifty-six days at anchor at Sebastopol, and during that time all its side-planks were so pierced by these formidable insects, that they look exactly like a sieve. Covered with innumerable holes, the entire outside of the vessel, if a part is broken off, resembles a sponge, and it is quite unfit for service. German Paper.

Remarkable Phenomenon.—A paper was read by Lieut. Newbold, of the Madras Amy, at a late meeting of the Asiatic Society, containing a narrative of a visit made by himself, in June 1840, to the Gibel Nakus, or Mountain of the Bell, on the peninsula of Mount Sinai. This curious hill has been long celebrated for the extraordinary tones elicited from it, which have generally been compared to the deep looming of a church bell. Of the cause of the phenomenon many opinions have been broached. The Arabs in the neighborhood, with their ordinary propensity to a belief in the marvellous, attribute it to the real bells of a subterraneous convent, swallowed by some convulsion of nature; and the Christian monks of Mount Sinai countenance the belief, by the idle story that the sound was first heard after the destruction of one of their convents in its vicinity. The ideas of European travelers on the matter, have been sometimes scarcely more reasonable. Some have supposed the sounds to be caused by the dropping of sand into the cavities of the rocks; others, by its motion over hollow rocks; others, again, have attributed them to subterraneous volcanoes; and a few have supposed that the action of the wind upon the elastic plates of mica, which is a component part of granite, may be the origin of the sound. Lieut. Newbold seems to have proved that the opinion of Capt. Wellsted is correct, that the sound is produced by the rolling down of the sand, put in motion by the wind, or by persons walking on its surface. Lieut. Newbold, left Waldi For, on his visit to the Mountain of the Bell, on the 16th of June. After two hours' riding, and a short walk of half an hour, he reached the place, which he describes as a bell-shaped hill, from 350 to 400 feet in height. On its western side which faces the Red Sea, is a slope of about 80 feet, covered with a very fine quartzose sand, varying in depth from five or six inches to as many feet, according to the form of the sandstone rock which it covers. This is the spot from

whence the mysterious sounds issue. Not the slightest noise was heard; but their Arab guide, desiring them to wait still at the bottom of the slope, began to ascend, the slope, sinking to his knees at every step. The travellers soon heard a faint sound, resembling the lower string of a violoncello slightly touched; and being disappointed at the result, determined to ascend themselves, in spite of the intense heat of the sun, and extreme fineness of the sand. On reaching the summit, they sat down to observe the effect. The particles of sand set in motion agitated not only those below them, but, though in a less degree, those all around them, like the surface of water disturbed by a stone. In about two minutes they heard a rustling sound; and then the musical tone above alluded to, which gradually increased to that of a deep, mellow church-bell, so loud that it rivalled the rumbling of distant thunder. This occurred when the whole surface was in motion; and the effect upon themselves the travellers compared to what they supposed might be felt by persons seated upon some enormous stringed instrument, while a bow was being slowly drawn over the chords. They descended while the sound was at its height; and soon after it began to lessen with the motion of the sand, until at the end of a quarter of an hour, all was perfectly still again. Lt. Newbold remarked that the surface of the land was in every part traversed by waves, or furrows, from one to two inches in height; and, from the triangular form of the face of the slope, increasing in length as they got nearer the earth. He also noticed that the sand in motion, when near the top, produced shriller notes than when lower down; and, consequently that the lowest notes were heard at the bottom. He appears from this to draw some analogy between the increasing length of the waves and that of the chords of a stringed instrument. While the experiment was making there was a steady breeze from the west, blowing against the surface of the sand; and this he considers essential to the production of the sound, it having been found that the sounds are much fainter in still weather; or even quite inaudible. When the weather is wet no sound is produced, because the sand is then agglomerated, and will not slide at all. The paper concluded with a remark by Lt. Newbold on the singularity of the phenomenon, observing that he had seen in Spain, Arabia, and Egypt many localities where loom sand had accumulated under circumstances apparently similar to those of Gibel Nakus, but where nothing has been heard of a similar nature: at the same time he regretted that leisure and opportunity had not admitted of an examination of localities sufficiently minute to put the matter beyond doubt. Lond. Atheneum.

Why the Nettle stings.—The common or large nettle is known by grievous experience to every one, though, perhaps, you have never yet inquired whence the pain arises from touching it. The sting is not like a pin or needle, solid throughout; but is hollow at the centre, and perforated at the point; and when touched, it is not only sharp enough to pierce the skin, but also is so constructed as to inject a particle of poisonous fluid into the wound it makes, and this is the source of the pain which follows. The wound itself is so minute that it would scarcely be felt; but the poison irritates, inflames, and causes the well known pain alluded to. The plant, the small species of which stings

the most severely, is covered all over with hairs: but, by using a microscope or a magnifying glass, you may perceive that these are not all of one kind, some being perforated, which are the stings, while others are not. Each sting stands upon a pedestal, and this pedestal performs the office both of a gland and poison-bag. It is cellular and spongy within; the sting is placed in its top, and may be moved by a light pressure to either side, or round in a circle; it seems to stand, as it were, on a universal joint. When a body touches its point, the base is pressed down into the spongy pedestal, and the poisonous fluid rushes up through the tube of the sting, and flows out of the terminal aperture. Lon. Sat. Jour.

Manufacture of Rose Water.—The rose trees come into flower at the beginning of March, and continue so through April. In the morning early, the flowers are plucked by numbers of men, women and children, and are conveyed in large bags to the several contracting parties for distillation. The cultivators themselves very rarely manufacture. The native apparatus for distilling the rose-water is of the simplest description, and need not be described. The best rose-water bears the proportion of 1000 roses to a seer and a half (about a pint and a half) of rose-water. The roses are put into the water without removing the calices, and just as they come from the gardens; but an acid smell is occasionally met with in the native rose-water, which would not be the case if the petals only were used. The attar is always made at the beginning of the season, when the nights are cool. In the morning early, the little film of attar, which is formed upon the surface of the rose-water during the night, is removed by means of a feather, and it is then carefully placed in a small phial; and day after day, as the collection is made, it is placed for a short period in the sun; and after a sufficient quantity has been procured, it is poured off clear, and of the color of amber, into small phials. Pure attar, when it has been removed only three or four days, has a pale greenish hue; by keeping it loses this, and in a few weeks time it becomes yellow. The first few days' distillation does not produce such fine attar as comes off afterwards, in consequence of the dust or little particles of dirt in the still and the tube being mixed with it. This is readily separated, from sinking to the bottom of the attar, which melts at a temperature of 84°. From one lac of roses, it is generally calculated that 180 grains, or one tolah of attar can be procured; more than this can be obtained if the roses are full-sized, and the nights cold, to allow of the congelation. The attar purchased in the bazaar is generally adulterated, mixed with sandal oil or sweet oil. Not even the richest native will give the price at which alone the purest attar can be obtained; and the purest is sold only to Europeans. The natives are very fond of using the rose-water as medicine, or as a vehicle for other mixtures; and they consume a good deal of the petals for the conserve of roses, or *goolcund*, as they call it.

Lond. Lit. Gaz.

The Landscape Painter.—But let us come to the landscape painters, nature's own limners and interpreters, they who should be not merely the delineators, but also the poetical translators, of all that she has of fair or beautiful, of terrible or sublime; men whose hands should be such servants to their eyes, and their eyes to their souls, that the facts

and deeds of the material universe should be conveyed by them to all men in legible and harmonious characters. The landscape painter is one of that order of nature's priests whose duty it is to represent, as it is of others to proclaim, the order and excellence of the Creator's works; and in this exercise of his functions he is required to use the same warmth of feeling, the same ardor of imagination, the same desire to bring out and put forward all that is brightest and best in what he beholds, as the poet is, whose sphere of descriptive action is limited to words, and the extent of whose delineative powers is determined by the white paper and the flowing pen. It has been justly remarked, that the painter of inanimate objects should not attempt to give them merely as they are, that is, as they strike his own individual perception; but that there should be a certain selection of the good, and a suppression of the bad parts, which may be sure of procuring an agreeable effect upon the minds of his fellow men,—that is to say, of his judges. So much of the beauty of an assemblage of objects, or of its ungracefulness, depends upon the frame of mind of the observer, that the reason of this precept is readily perceptible; and sanctioned, as it has been, by the almost uniform practice of all the greatest masters, it may now be laid down as a fundamental canon of art. The fact is, that the vulgar and uninformed mind is rarely so much touched by the mute language of the creation, the real "harmony of the spheres," as it ought to be; it is dull in perceiving the analogies, and in feeling the associations, of ideas to which a cultivated mind is all alive, when the eyes are feeding on some exquisite specimen of the Almighty's handiwork: the eye has no communion with the soul, and the ideas that are impressed become easily effaceable from the barren tablets of the memory. It is not the peasant who feels the beauty of the spot on which he lives; it is the man who is a reader, a thinker, a searcher after what is good and great; who knows how, not only to admire the glorious works of the parent of good, but also to praise the beneficent hand that has placed him amidst them. As with men so it is with rude or partially civilized nations; the love for landscape painting is one of the latest tastes that spring up among them; and it is a branch of art that is only beginning to develop itself, where the others have reached a state of maturity. "Of all modes of painting," says M. Délécluce, a French critic of great renown, "that of landscape seems to be the one that most requires experience of art, and long and laborious observations of nature. Nearly all the famous landscape painters, Claude Lorraine and Poussin, among others, only betook themselves to their styles, at a late period, and attained to excellence in them after long study of nature, and when their well practiced hands had overcome all difficulties, of practical execution. Landscape painting, in the course of a painter's works, holds nearly the same place as descriptive verses and moral descriptions do in those of a poet: in each case they are the results of maturity of age, of the autumn of life. Landscape painting is the last mode that is thought of being adopted; and it may be said that, in general, the descriptive style in literature, like landscape painting in art, is only appreciated, and therefore only cultivated, at certain epochs of civilization, when disgust for men and things leads back the mind to simple ideas, and the grand calm picture of nature. Literary Gaz.

Longevity of Trees.—At Ellerslie, the birth-place of Wallace, near Paisley, there is an oak tree which is said to have concealed under its branches, Wallace and three hundred of his followers. However doubtful this may be, it is certain that "the Wallace Oak" cannot be much less than seven hundred years old. Eight olive trees still grow in the garden of Gethsemane, near Jerusalem, which can be proved to have been there more than eight hundred years ago, and which are alleged to have been witnesses of the Savior's agony. Such great antiquity, however, is small when compared with the age of the baobab, some specimens of which, growing in Africa, Adanson found to be 5150 years old! Adanson ascertained some banian trees to be of equal antiquity. London Sat. Journal.

Gregarious Spiders.—Upon the banks of the Amazon, spiders, which are solitary in Europe and Asia, live in congregated societies of several thousands. Taking possession of a tree they unite in forming a net entirely over it. When this net is completed, they take their several abodes; each secures its own prey without disturbance; each labors for itself; but in case of damage to their net, they labor to repair it for their general good. London Sat. Jour.

Rope Making.—Sir William Burnett recommends the disuse of tar for yarns, and produces strong evidence to show that white yarn prepared is thirty-seven and a half per cent. stronger than the like weight and gravity of hemp worked with tar in the usual way. Inventors' Ad.

Improved mode of Evaporation.—This invention relates to certain modes of improving the application of heat so as to obtain greater results from a given quantity of fuel.

Before describing the invention, it will be necessary first to point out the principle of action, and then to explain its application.

It is well known that a liquid when heated to its boiling temperature under the pressure of the atmosphere will emit steam; now if this steam is taken and forced into a worm or other apparatus, and the steam is compressed until it acquires a pressure of about $\frac{1}{12}$ of an atmosphere greater than its pressure when occupying the space in the evaporating vessel, between the cover and the surface of the heated liquid, it will become entirely condensed by giving up its latent heat to the surrounding heated liquid, and that at the rate of about three pounds of condensed steam per hour for every square foot of the heating surface of the worm. The steam produced by the evaporation of the heated liquid will thus, by its condensation, return to that liquid all the caloric absorbed from it, as latent heat, by the steam generated, and the evaporation of the heated liquid may thus be continued with the assistance only of the power requisite to compress the steam in the worm and the restitution of that quantity of caloric which may have escaped from the apparatus by leakage or radiation.

In order to carry the principle out practically, the inventor uses an evaporating pan, with an internal worm or series of pipes, offering a sufficient heating surface, and closed by a cover, the edge of which dips into a surrounding trough or other liquid, and this cover is provided with a valve, so regulated that it will open as soon as the internal pres-

sure becomes greater than that of the external atmosphere. To this evaporating pan is applied a pump for the purpose of drawing off the steam as fast as it is generated from the surface of the heated liquid in the pan, and force the same into the worm or other apparatus contained in the liquid; the worm having at its lower extremity a valve to regulate the escape of the condensed steam, being loaded so as to determine an internal pressure of from $\frac{1}{12}$ to $\frac{1}{6}$ of an atmosphere. The condensed steam that escapes will serve by means of another worm in a separate vessel to heat the liquid to be evaporated, previous to its introduction into the evaporating pan. Inventors' Ad.

New mode of obtaining Hydrochloric Acid.—At a meeting in May, of the Chemical Society of London, a paper was read from Dr. Gregory of Aberdeen, "On a simple and cheap method of obtaining Hydrochloric Acid." The chief impurities met with in commercial acid were stated to be sulphurous acid and sulphate of soda, the existence of which rendered it unfit for many of the purposes of the chemist. The latter is carried over in a part of the process by spouting, while the former distils over. Dr. Gregory finds that by employing two equivalents of sulphuric acid instead of one, as mostly used, these impurities are prevented from passing over. The first $\frac{2}{3}$ of the hydrochloric acid is produced without the slightest trace of water. He described a very simple and cheap apparatus for obtaining it, which allows of its being prepared in a sitting-room, and gave the details of his experiments, which were of a very interesting nature. He had produced some of the purest and strongest acid, the price of which was estimated to be from three-pence to four-pence per pound. He more particularly wished to recommend the process to manufacturers of re-agents.

Fusing Quartz.—Some very interesting experiments on the melting of rock crystal (quartz), and on the subsequent crystalization, and even casting of it, were detailed by M. Gaudin, at a late meeting of the French Academy of Sciences.

This very able chemist, by the use of his oxy-hydrogen blow-pipe, had succeeded in melting crystals of aluminum and silex, such as the white sapphire and the ruby. After vain attempts with compounds of silex and aluminum precipitated with their coloring matter, he had employed a mixture of ammoniacal alum, or potassic alum, with three or four hundredth parts of chromate of potassium. These two salts ground together with a little water, formed under the action of increasing heat, a transparent liquid, which was afterwards condensed into a friable porous paste. He had hollowed out this paste into the form of a crucible, with which he had capped his blow-pipe, and then blowing upwards, had found the interior of this crucible become studded with a multitude of exceedingly small rubies, of beautiful color and the finest water. Finding his blow-pipe too small, he had made another one of a block of platina, and, by means of this, had succeeded in melting and in spinning out rock crystal as easily as glass. He found that silex in a state of fusion is one of the most ductile substances in nature, and that the faculty of spinning glass depended on the quantity of silex it contained. It did not crystalize on cooling, but was very volatile; this had hindered

him from obtaining globules of more than three millimetres in diameter.

He had, however, spun out threads of silex so thin and fine, that they admitted of being tied in a knot, and had an iridescent appearance; they were so light, too, that the wind easily carried them away, and a quantity of them could be rolled in the fingers, looking like cotton. Threads of pure quartz were always cylindrical and transparent; those from sand stone and mill-stones were opaque, and had a nacreous appearance. Beryl emerald did not yield threads so well as other silicious stones; but from the opaque color of the threads of emerald, he inferred that a mixture of emerald and sand-stone would melt down into artificial pearls of great hardness. Aluminum he found to be deprived of all viscosity and hence it was impossible to spin threads from the ruby, or from Syrian garnet, topaz, fluorure of calcium (fluor spar), or the sand stone of Fontainbleau (Paris paving-stone). He had made from melted quartz some admirable microscopic lenses, and pivots for mariners compasses; he had also drawn out sticks of quartz applicable to tools for burnishers and watchmakers. Cor. Lit. Gaz.

Spenges.—At a late meeting of the Microscopical Society, Mr. J. S. Bowerbank read a paper "on the structure of the Horny Sponges of Commerce," a subject on which he has been for some time very actively and attentively engaged. Little was known as to the true structure and nature of sponges prior to Dr. Grant's observations, published in the London and Edinburgh Philosophical Magazine, 1827, in which he describes their form, structure, and mode of propagation, and considers them to be nearest allied to the corals; proving, at the same time, without a doubt, the animal nature of the sponge. Mr. Bowerbank has followed up and confirmed many of Dr. Grant's observations, adding much new and important matter connected with these, supposed, by some, to be animals, and by others vegetables.

Dr. Fleming, in describing the sponge (*spongia*), states, that they are "porous bodies, possessed of a cartilaginous skeleton, simple in their nature and destitute of earthy spiculæ." Mr. Bowerbank, however, has clearly proved that these characters are now fallacious. On examining the living sponge of commerce,—the sources of which are from the Mediterranean (the Turkey sponge) and the West India Islands, principally Bahamas,—with a power magnifying 500 linear, spiculæ are most evident, imbedded in the fleshy matter, and he is inclined to believe that there are very few without them. These spiculæ are composed of silex, and are obtained separate from the animal substance by burning the sponge, digesting the residuum in weak muriatic acid, and then examining them under the microscope. In the white sponges the spiculæ are composed of carbonate of lime, and when so treated are of course dissolved. The silicious spiculæ are however hollow and cylindrical, though not solid and angular, as stated by some observers. When subjected to the action of the flame of the blow-pipe, the hollow part, examined by a power of 500 linear, exhibits a dark carbonaceous appearance on the interior, produced by the destruction of the animal matter. This is also occasionally to be seen in the exterior of the spiculæ. The terminations or extremities are beautifully transparent. They have been likened by Professor Rymer Jones to the raphides or crys-

tals, found in the cells of plants; but Mr. B. cannot trace any analogy with these bodies, as they are angular and solid, and have not the same functions to perform as the spiculæ or skeleton of the sponge has. The occurrence of spiculæ in the Spongia fistularia, led Mr. B. to separate it from its present group in the system, and to adopt the new name of Fistularia for the genus. Mr. Owen asked Mr. B. if he had ever observed projections or barbes from the side of these silicious spiculæ of the sponge, to which he replied, he had, although only in one kind.

The sponges of commerce are usually prepared before they come to the market, by being beaten and soaked in dilute muriatic acid with a view to bleach them, and to dissolve any adherent portions of carbonate of lime. Three kinds are found commonly in the market, and known as, the Turkey, the variety of the same, which is very rare, and the West Indian.

On examining the living sponge of commerce with a power of about 500 linear, the fleshy matter will be distinctly observed, having in its interior, gemmæ, which are considered to be the young. These are occasionally given off from the mass of living matter. The greater portion of the mass of sponge consists of small cylindrical threads or fibres, various in size. The spiculæ are not found within these, but in the large and flattened fibres, and varying in number from one to three or more, imbedded in their substance. Sometimes one spiculum projects a half or more from the side of the fibre, and is then only covered with the animal matter at the base, or half way up. The fibres of the West Indian species of sponge have been clearly proved by Mr. B. to be solid.

In the rare variety of Turkey sponge, the fibres are possessed of vessels which are astimose in various directions, differing much in size, and not imbedded in horny fibre, but in a separate sheath. Mr. B. considers that this true vascular tissue performs very important functions in the economy of the animal during life. In some of the tubes of sponge he observed small globules, the largest of which measured the 1666th of an inch, and the smallest the 50,000th of an inch. He is convinced that they shift, as by accident they were perceived to move from right to left. Inventors' Adv.

The Margins of Railways.—The margins of great lines of railway that have been some years executed, are now becoming covered with grass, and much more agreeable to the eye than before; and, while lately gliding along the line to Birmingham, it occurred to us that additional interest might be given to the banks, at very little expense, by planting a collection of trees and shrubs on them. The plants might be a furlong apart; those on the sides of the deep cuttings may be shrubs; those on the sides of the embankment tall trees; and those where the ground on each side is nearly on a level with the road, middle sized trees; such as thorns, Pyrus Sorbus, &c. Half way between each tree or shrub might be a tall-growing, striking, herbaceous plant, such as the hollyhock, Siberian parsnip, &c. We are not aware of any objection to this idea except the expense, which could not be very great, and if ever the ground came to be pastured by sheep, which we think must be its ultimate destination, the herbaceous plants might be given up. The trees and shrubs, when once planted, would require no expense whatever to keep them up, because the nurseryman who planted them might contract to keep them in order for three years, when they

would be fully established. The herbaceous plants would require a small annual expense, but they might be omitted or given up when the ground was to be pastured.

The fine effect of herbaceous plants and trees, may be seen on the bank on the right hand side of the approach to the London terminus of the Great Western Railway. There the trees and plants are, very properly, numerous, so as to form a plantation; but along the railroads we propose the trees or shrubs to be a furlong apart, so as to form what may be called a varied running foreground to the passing scenery.

The directors to all the railways may have paid most laudable attention to the architecture of the bridges, station-houses, and all other buildings, and have succeeded in blending utility with architectural beauty in a highly gratifying degree. It would be only consistent, therefore, to confer some ornament on the naked banks, the formation of which was not less necessary to the existence of the railway than the building of the viaducts and bridges. To any person at all fond of viewing trees and shrubs, the recurrence of a new species or variety about every minute, would be a source of perpetual interest, and would not interfere with the distant scenery. The collection on one side of the road should have no connection with the collection on the other side, in order that a person wishing to see the whole, might confine himself entirely to looking to one side in the going, and to the opposite side in returning. Many beautiful trees and shrubs might thus be brought into notice, that at present few people know anything of. The banks of railroads in some parts of the country, when once they are completely separated from the road by the growth of the hedge, or by some other effective fence, might be let out as garden ground, or for orchards; but, in general, too little attention has been paid to preserving the old surface soil on the new surface, for these kinds of occupation. Gardeners' Magazine.

[We commend these suggestions to the notice of railroad companies in our own country: planting trees and shrubbery upon embankments and the sides of excavations, wherever practicable, would be attended with some additional cost for the first few years; but in the end it would amply repay this outlay by protecting the banks against the destructive action of heavy rains.—*Ed. Rep.*]

The Flight of Locusts.—In the vicinity of Odessa, a city in Russia, the visitation of a flight of locusts is more dreaded than the incursion of an army of warriors; it is considered a most dreadful calamity. The flight of these insects at times literally darkens the sun. In some years everything is eaten up; not a blade is left for man or beast; not a single green leaf remains either on herb or tree. Instances are known of people dying of actual hunger not far from the city above mentioned, during the famine occasioned by their devastations. Locusts are therefore the greatest scourge that the country is exposed to, and no sooner do they appear than the poor peasant prognosticates misery in a future year; for it appears that it is not always by actual invasion in flights that the greatest harm is done, but also by the larvæ bred from insects, deposited in the ground during a previous visit. The severe cold of winter has no effect on them; the only thing that destroys the egg is a smart frost in August. When the locusts come in their dense array

from the south, nothing but noise has any effect in preventing them from settling in any spot. It is well known also that bees may be prevented in like manner, by sound, from flying in any particular direction. An English lady gave the author a very amusing account of the musical entertainments held in her house and garden a few years before, at the time swarms of locusts were in progress. Her husband and lord was, as of right, leader of the harmonious band; and for this purpose armed himself with a huge bell, which he swung with amazing effect. Next to him came the gardener with his watering pan; after this zealous functionary came the footman with the fire shovel; then the housemaids with their pots and kettles; and finally, the children of the family, equipped with tea boards and toasting forks, which assuredly played no secondary part in the noisy concert. Ever as the hour of danger returned the performers were at their posts, walking up and down, to their own great amusement and delectation, but greatly to the dismay of the locusts as well as of the families in the adjoining houses, who thought that their English neighbors had all gone mad. So effectual, however, were those performances, that while not a leaf was left in any other part of the land, this well-watched garden continued as verdant as ever. Bremner's Excursions in Russia.

Eels killed by Frost.—F. W. Jennings, in a letter to W. Thompson, dated Cork, March 18th, 1841, writes as follows:

"I send you the following account of a phenomenon which took place in the river Lee, about six miles below Cork, in some respects similar to that which occurred in the river Lagan. I much regret not having heard of the circumstance until nearly a month after it had occurred, and then I was not able to glean any information except from the boatmen in the vicinity; the remembrance was however fresh in the minds of all, and the testimony of those I consulted agreeing in every particular, I am confident that the following account must be true.

"During the 5th, 6th and 7th of February, the ground being covered with snow and the weather intensely cold, the boatmen in the vicinity of Passage, Monkstown and Carrigaloe captured considerable numbers of the conger eel (*Anguilla conger*, Lin.) of all sizes, varying from a foot to five and six feet in length. Many of them were left on the strand as the tide receded, some dead, but the greater number alive; others were followed in the boats as they swam near the surface of the water, and killed with sticks, whilst many committed suicide by swimming up on the strand. In a similar way they were caught from Hop Island to Ringas Riddy, a distance of five miles on the west side of the Lee, and from Smith Barry's bay to the lime kiln opposite Monkstown, (about three miles) on the east side. Those which were taken on Hop Island seemed to have been washed up by the tide, as they were dead. It appears strange that a fish like the eel, usually found at the bottom of the rivers, should be affected by the cold, when one reflects that the depth of the river varies in some of these places from 40 to 60 feet: the water here, though not quite so salt as the sea, is yet very salt. One individual caught as many as 37; but it would be impossible to form any idea of the numbers taken, as immense quantities were picked up by the boatmen and others as they walked along the strand. As such

a long time elapsed before I heard of the circumstance, I had no opportunity of seeing any of them; but there can be no doubt that they were the conger eel. Dr. Scott, of Cove, was kind enough to give me from his meteorological journal the temperature and the direction of the wind about and during the time of the event:

Feb. 1841.	Max.	Min.		Wind at 9 A.M.
3,	29,	27,	Snowy.	E.
4,	28,	25,	Snowy.	E.
5,	30,	27,	Snowy.	E. S. E.
6,	31,	28,	Snowy.	E.
7,	30,	27,	Snowy.	E.
8,	38,	34,	No snowfall.	E.
9,	40,	33,	No snowfall.	N. E."

Value of Thread for Lace.—The exquisitely fine thread which is made in Hainault and Brabant, for the purpose of being worked into lace, has occasionally attained a value almost incredible: 1000 to 1500 francs is no unusual price for it by the pound; but some has actually been spun by hand of so exquisite a texture as to be sold at the rate of 10,000 francs, or upwards of £400, for a single pound weight. Schools have been established to teach both the netting of the lace and drawing of designs by which to work it; and the trade at the present moment is stated to be in a more flourishing condition than it has ever been known before, even in the most palmy days of the Netherlands.

Improvements of poor Sand Land.—The poor sandy heaths which have been converted into productive farms, evince the indefatigable industry and perseverance of the Flemings. It is highly interesting to follow step by step the progress of improvement. Here you see a cottage and rude cowshed erected on a spot of the most unpromising aspect, where the loose white sand, blown into irregular mounds, is only kept together by the roots of the heath. Trenching and leveling the surface is always the first operation. A small spot only is first cultivated; but gradually the whole is reclaimed from its wild state by the aid of unremitting industry, and above all, by the dung and compost heaps and by the urine of animals. If there is no manure at hand, the only thing that can be sown on poor sand at first is broom: this grows in the most barren soils, and in three years it is fit to cut, and produces some return in faggots for the bakers and brickmakers. The leaves which have fallen have somewhat enriched the soil, and the fibres of the roots have given a certain degree of compactness. It may now be ploughed and sown with buckwheat, or even with rye, without manure. By the time this is reaped, some manure may have been collected, and a regular course of cropping may begin. As soon as clover and potatoes enable the farmer to keep cows and make manure, the improvement goes on rapidly. In a few years the soil undergoes a complete change; it becomes mellow and retentive of moisture, and enriched by the vegetable matter afforded by the decomposition of the roots of clover and other plants. If about twenty small cartloads of dung can be brought on each acre of the new trenched ground, the process is much

more rapid. Potatoes are then the first crop, and generally give a good return. The same quantity of dung is required for the next crop, which is rye, in which clover is sown in the succeeding spring; and a small portion is sown with carrots, of which they have a white sort that is very productive and large in good ground, and which, even in the poor soil, gives a tolerably supply of food to the cows in winter.

Should the clover fail, which sometimes happens, the ground is ploughed in spring, and sown with oats and clover again. But if the clover comes up well amongst the rye stubble, it is cut twice, after having been dressed with Dutch ashes early in the spring. It is mostly consumed in the green state. The clover bed is manured with ten cartloads of dung to the acre, and rye sown again, but not clover. After the rye, comes buckwheat without any manure; then potatoes again, manured as at first; and the same rotation of crops follow. It is found that the poor land gradually improves at each rotation from the quantity of dung used. For want of sufficient manures, broom-seed is sometimes sown with the rye and clover. The rye is reaped, and the broom continues in the ground two years longer. It is then cut for fuel. The green tops are sometimes used for the litter for the cows, and thus converted into manure. It is also occasionally ploughed in when young and green, to enrich the land. Oats, clover and broom are occasionally sown together. The oats are reaped the first year; the clover and young broom tops the next; and the broom cut in the third. This is a curious practice, and its advantages appear rather problematical. All these various methods of bringing poor sands into cultivation show that no device is omitted which ingenuity can suggest to supply the want of manure. After the land has been gradually brought into a good state, and is cultivated in a regular manner, there appears much less difference between the soils which have been originally good and those that have been made so by labor and industry. At least, the crops appear more nearly alikc at harvest than is the case with soils of different qualities in other countries. This is a great proof of the excellence of the Flemish system; for it shows that the land is in a constant state of improvement, and that the deficiency of the soil is compensated by greater attention to tillage and manuring, especially the latter. The maxim of the Flemish farmer is, that "without manure there is no corn; without cattle there is no manure, and without green crops and roots cattle cannot be kept." Every farmer calculates how much manure is required for his land every year. If it cannot be purchased, it must be made on the farm. A portion of land must be devoted to feed stock, which will make sufficient for the remainder; for he thinks it better to keep half the farm only in productive crops, well manured, than double the amount of acres sown on badly prepared land. Hence, also, he does not reckon what the value would be of the food given to cattle, if sold in the market, but how much labor it costs him to raise it, and what will be the increase of his crops from the manure collected.

The land is never allowed to be idle so long as the season will permit anything to grow. If it is not stirred by the plough and harrows to clear it of weeds, some useful crop or other is growing in it. Hence the practice of sowing different seeds among growing crops, such as clover or carrots among corn or flax; and those which grow rapidly, between

the reaping of one crop and sowing of another, such as spurrey or turnips, immediately after the rye is cut, to be taken off before wheat sowing. These crops seem sometimes scarcely worth the labor of ploughing and sowing; but the ploughing is useful to the new crop, so that the seed and sowing are the only expenses; and while a useful crop is growing, weeds are kept down. Rham's Flemish Husbandry.

Wood Lice.—By the following very simple method, frames and pits might be kept comparatively free from wood lice; at any rate, the insects might be so far subdued by it as not to be injurious to plants: Put a cold boiled or roasted potato into a small flower-pot; cover the potato with moss, leaving a little hanging out of the pot by way of enticing the insects to enter, then lay the pot on its side in the corner of the frame. Wood lice feed in darkness, and at the approach of day fly to their hiding places in cracks and crevices, or amongst the loose soil or bark; the moss is therefore necessary to induce them to remain in the pot, to which they will flock in hundreds after having tasted the potato. Every morning the pots should be taken out of the pits, and the insects destroyed; the same bait will serve for a week or longer. If properly attended to, half-a-dozen pots so prepared will soon clear the frames of this troublesome insect. Gardeners' Chronicle.

Protection of Plants by Galvanism.—The sensation of galvanism is produced by placing in contact plates of zinc alternating with plates of copper, with a piece of moistened cloth between each. This forms what chemists call a galvanic battery; and it is by exciting this chemical power in its simplest and feeblest form that the efficacy of the galvanic protector depends. If a snail or slug be placed on a plate of zinc, to which a narrow plate or strip of copper is fixed near the edge, and the zinc turned over it so as to form a rim of zinc, copper and zinc, it creeps unmolested on its surface; but as soon as it touches the rim where the copper is, it receives a galvanic shock, (its moist soft body acting as the moistened cloth above mentioned, and thus forming the galvanic circle complete) and immediately recoils, twisting itself back, and rarely venturing the second time to approach the copper to receive another shock. To protect a crop or plant, then, it is only necessary to have a zinc plate of sufficient length to surround it, of 5 or 6 inches in breadth, with a strip of sheet copper one inch broad riveted to the upper part of the strip of zinc, and the zinc turned over it so as to form a rim. The plate so prepared is to be set on edge round the bed or plant to be protected. The cost of the plates complete is said to be about 6*d* a lineal foot, so that a circular plate to inclose a space 6 inches in diameter will cost about 9*d*; or, allowing 2*d* for uniting the two extremities, 11*d*. We have had one circular rim made by Messrs. Cottam & Hallen, Winsley street, Oxford street, with the copper on the inside instead of the outside, and having inclosed a number of snails and slugs in it, we find them hitherto effectually imprisoned. This we conceive to be a more efficient test of the galvanic influence than employing it to protect a plant; because, in the latter case, the creature may turn for food elsewhere, but in the former it must starve if it does not cross the galvanic boundary. London Gard. Mag.

DESCRIPTION OF AMERICAN PATENTS

Granted from May 4th to June 7th, 1841.

Improvement in the manner of constructing a Machine for applying animal or other power to the propelling of Machinery. By J. Francis Moore, Falmouth, Va. May 4th.

Claim.—What I claim therein as new, and desire to secure by letters patent, is the manner in which I have combined and arranged the respective parts thereof as set forth; that is to say, I claim the combination of the two wheels C and D, with the two platforms A and B, and with each other, in such manner as that said wheels shall be supported in their respective platforms by truck or friction wheels, and revolve thereon without the aid of axles or gudgeons.

I claim also the particular arrangement and combination of the four wheels, in the manner set forth; the two larger wheels having their cogs or teeth on the interior of their rims, and mashing into or engaging with the two smaller by an arrangement of the respective parts, substantially the same as herein described.

Improvement in Harvesting Machines, for Cutting, Threshing, and Winnowing Grain. By Damon A. Church, Friendship, N. Y. May 4th.

Claim.—It is to be understood that I do not claim, as before stated, to be the first to have attempted to perform the process of cutting, threshing and winnowing grain by means of one combined machine; my invention consisting of certain improvements in the construction of certain parts thereof, and in the particular manner in which I have combined these parts with each other. I claim the manner of constructing the knives or cutters, so as to hang each of them upon a rod or joint pin, whilst they are each sustained by a spring in the manner set forth, by which means they are regularly borne up against the edges of the gathering wheel, rendering its action upon them uniform and perfect. I claim the combination of the endless aprons R, h' and j' in the manner set forth, for carrying the cut grain from the cutters or knives to the threshing cylinder. I claim the combination of the endless aprons F and k', the former being made of net-work for the purpose set forth, and the latter receiving the grain therefrom, and carrying it back to the winnowing apparatus, by an arrangement and combination of parts substantially the same with that described.

Improvement in the Gudgeon or Pivot and Step of Mill Spindles and other Vertical Shafts. By Jacob Staub, Georgetown, D. C. May 4th.

Claim.—What I claim as my invention and improvement, and which I desire to secure by letters patent, is the arrangement of the lower removable plug B, in the step or bed C, in combination with the upper removable plug B′ in the spindle or shaft A, provided with a hole to admit oil from the box D, for the purpose and in the manner specified.

Improvement in the manner of arranging the Paddles of Paddle Wheels for Propelling Vessels. By P. G. GARDINER, New-York. May 4th.

CLAIM.—Having thus fully described the nature of my invention, and shown how the same is to be carried into operation, I do hereby declare that I do not claim the mere placing of the buckets in such manner as to form an angle with the axis or shaft of the wheel, this having been done, but with other views, and under arrangement differing from those adopted by me; but what I do claim as constituting my invention, and desire to secure by letters patent, is the placing of a double series of buckets so as to form an angle of 45°, more or less, with the axis of the wheel, said buckets having each of their inner ends attached to a distinct arm, thus allowing a free or open space between each bucket, in each series of buckets, as set forth; said buckets being convoluted in consequence of their being attached to radiating arms, in the manner herein fully made known.

Improvements on the Danforth or Cap Spinner, which are applicable to other Spinning and Twisting Machinery. By CHARLES DANFORTH, Paterson, N. J. May 4th.

CLAIM.—The principle of this invention, for which I claim a patent, consists of the combination of the main shaft and pulleys thereon, with the inclined pulleys on the lifters, and the end pulleys and radius rods, carrying, sustaining and guiding a band or cord so as to drive the bobbins resting on the band or cord at the required rate and force, the bobbins being constructed and kept supplied with oil as aforesaid, substantially as above described.

I also claim the method of supporting, guiding and working said endless band or cord, by means of the inclined carrying pulleys on the lifters, and the grooved end pulleys, in connection with the grooved pulleys on the main shaft, thereby giving motion to the bobbins, by causing an endless band or cord to pass under them, with their weight bearing on said band or cord, substantially as aforesaid, by whatever mechanical means the regulating action effected by the radial rods may be produced.

I also claim the reciprocating motion given to the grooved end pulleys by means of radius rods, studs, and brackets, essentially as herein described. I also claim the method of applying oil to the spindles and bobbins in spinning machinery, substantially as above described.

And I further claim as my invention, the use of inclined pulleys upon lifters, carrying and guiding a band or cord, upon which bobbins are made to rest and be turned, substantially as aforesaid, by whatever mechanical means the said band or cord may be guided to and from said inclined pulleys, as the lifters rise and fall in the operation of any spinning machines to which said inclined pulleys, bands, or cord may be applied. I also claim the combination of pulleys, whether inclined or not upon the lifters, with a band or cord and bobbins resting upon them, and carried by said band, substantially as aforesaid. I also claim the combination of pulleys, inclined or not upon spindle rails, carrying, guiding and moving bobbins by the weight of these on a band or cord, as aforesaid.

Improvement in the Apparatus employed for separating Gold from its Ores and the Earthy Substances combined with it. By THOMAS SEAY, Columbia, Ga. May 4th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the constructing of the above described rocking trough or amalgamator with an undulating surface on its bottom plank, in combination with the top plank, provided with pins, and fitting into said trough which will produce the desired effect.

Improvement in the construction of Beehives. By CONSTANT WEBB, Wallingford, Ct. May 4th.

CLAIM.—I do not claim as my improvement the movable bottom merely, nor the suspension of the hive for protection from the moth; both are common; but I do claim as my invention and improvement, and as new and useful, the peculiar form of the construction of the hive, by making the front board shorter than the sides and back, so that the bottom is made to slide in and rest on cleats attached to the inside of the sides, and can be wholly drawn out for the convenience of hiving bees, and when hived can be replaced, and the hive closed without shaking it or disturbing the bees till the hive and its contents are safely removed to its proper station: all which I claim in combination with the mode of suspending the hive so as to make the bottom an inclined plane, while the top and body of the hive project forward, to protect the bees from storms, &c. all substantially in the manner specified above.

Improvement in Fanning Mills or Machines for Winnowing Grain. By DAVID PHILIPS, Georgetown, Pa. and ASA JACKSON, Franklin Mills, Lincoln county, Va. May 4th.

CLAIM.—What we claim as new and of our invention, and which we wish to secure by letters patent, is the construction of the winnowing machine or fan, with a vertical flue or aperture *(B)* as set forth, in combination with the inclined plane *(P)* and the vertical plates I, J and L, the two being governed by regulators C and D; the whole combined, constructed and operating substantially in the manner described in the specification.

Improvement in the method of arranging the Keys in Pianofortes. By JOHN DWIGHT and DANIEL B. NEWHALL, Boston, Mass. May 6th.

CLAIM.—What we claim as our joint invention and improvements is the concave curvature of the bed of keys in front, as herein described.

Improvement in the Latch of Door Locks. By JOHN P. SHERWOOD, Sandy Hill, Washington county, N. Y. May 6th.

CLAIM.—I do not claim the employment of a weight to work the latch-bolt as a substitute for a spring, this having been previously done; but what I do claim as my invention, and desire to secure by letters patent, is the method of working the bolt by means of the sliding car, as herein described, and also the mode of connecting the latch-bolt with the sliding car by means of the link I, for the purpose and in the manner described.

Improvements in Machinery for removing Bars and other obstructions from Harbors and Rivers, and for forming and cleaning out Docks. By J. R. PUTNAM, New Orleans. May 6th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the combination of the scrapers K K with the several plates M M, for the purpose and in the manner described. Also, the arrangement of ploughs, in combination with the cutters J, for the purpose and in the manner specified.

Improvement in the machine for Washing Clothes. By GEORGE WATERMAN, Johnston, R. I. May 11th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the vibrating bottom in combination with the dashers, as specified and described.

Improvement in Hot-Air Furnaces and Fire Grates for heating Apartments, &c. By WM. H. WHITELEY, Charlestown, Mass. May 11th.

CLAIM.—What I claim, and desire to have secured by letters patent of the United States, is the improvements in hot-air furnaces and fire grates. The said improvements consist in the mode in which I have combined the concentric cylinders *p*, with the cylinder or fuel chamber J, and the cases D and E, by arranging them over the fuel chamber and within the said cases, so that the spaces between them shall form alternately air-heaters and flues for conducting off the smoke and gases, as herein before described. And the construction of the fire grate *(d)* on the principle of a wedge, (either by means of the cheeks *(e)* or making the whole fire grate in that form) in combination with the double action of the catch or scraper *(h.)* Not limiting myself to any specific number of concentric cylinders, nor to any particular angle or bevel in the fire grate, but adapting both the number of the cylinders and the angle of the grate to the size and position of the furnace. Neither do I confine myself to the application of the improved fire grate to hot-air furnaces alone; but I claim the use of the improvement, whether applied to furnaces, stoves, or open grates.

Improvement in the construction of Hydrant Cocks. By EBENEZER HUBBALL, Baltimore, Md. May 11th.

CLAIM.—Now what I claim as my invention, and which I desire to secure by letters patent, is the making of the hole in the screw C, through which the piston X enters the cock A square or polygonal in the piston corresponding therewith, where the piston passes through the screw as above described, so that by turning the stock or top I, the screw C can be unscrewed and taken out along with the piston, so as to permit the leather to be renewed, and the piston and screw afterwards replaced without removing the earth or disturbing in any manner the hydrant in the ground; and although I make use of the terms square and polygonal, I would conceive my patent infringed by the use of any shape of piston and opening in the screw whereby the same power to unscrew and screw in again without disturbing the hydrant would be obtained.

Improvement in Smut Machines. By JACOB DEMUTH, of the city of Lancaster, and BENJAMIN BAUMAN and LEVI BECK, of Lancaster township, Pa. May 11th.

CLAIM.—What we claim as our invention, and desire to secure by letters patent, is, the beaters, consisting of the rods D and E, and the plates H and G, arranged on the shaft A, as set forth, in combination with the cylinder constructed with angular straps as described, revolving horizontally, the beaters and cylinder in opposite directions.

Improvement in the Wind-chest or Bellows-box attached to the Hearth of Blacksmiths' Forges. By CHARLES FOSTER, Rochester, N. Y. May 11th.

CLAIM.—I disclaim the original invention of the bellows-box; and what I claim as my invention, and desire to secure by letters patent, is the method above described of constructing the top of the box by forming it with two oblong apertures or tubes inclined towards each other, for the purpose of concentrating the draft of air and increasing its power of action on the fire.

Improvement in the manner of operating Paddles for propelling Steam and other Boats or Vessels. By SAMUEL SWETT, jr. Chelsea, Mass. May 11th.

CLAIM.—What I claim therein as constituting my invention, and desire to secure by letters patent, is the giving to the paddles or buckets, in the particular kind of apparatus herein described, by propelling boats or other vessels, an independent vibratory motion within the vibrating frames to which they are attached, for the purpose of causing them to enter and to leave the water in a line inclined from the perpendicular; the whole being constructed substantially in the manner and for the purpose herein fully set forth.

Improvement in the method of constructing Staves or Billets of Cast-iron for packing Tobacco, &c. into square Boxes. By THOMAS SAMSON, Richmond, Va. May 11th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the constructing and using of four staves or billets of cast iron, or other suitable metal, said staves being cast hollow, and having their contiguous edges formed with a mitre joint, or in such manner as will admit of their being drawn together by means of the bands or hoops by which they and the contained box are to be embraced when in use; the whole being constructed and operating substantially in the manner herein fully set forth and made known.

Improvement in Argand Lamps. By JOHN S. TOUGH, Baltimore, Md. May 11th.

CLAIM.—I do not mean to claim a combination of the conical rim and regulating button; but what I claim as my invention, and which I desire to secure by letters patent, is the combination of the conical rim at the bottom of the globe, with the inverted cone regulator or button and adjustible cylinder, adapted to and combined with the wick case, as set forth.

Improvement in the Apparatus for the relief of Debility or Weakness in the Legs. By STEPHEN P. W. DOUGLASS, Palmyra, N. Y. May 15th.

CLAIM.—I claim the application of the spring as shown at *c c*, in fig. 1, or of the springs as shown in figs. 3 and 4, for the purpose of keeping up a continued tension on the knee joint, and of checking the flexure of the jointed pieces A, A. I claim the manner of forming and arranging the parts by which the apparatus is attached to the foot; that is to say, the combination of the iron bow *a a'* with the piece A, and with respective straps appended thereto, as herein set forth. I claim the manner of combining the side straps, the patella cap, and the jointed pieces with each other, for the purposes and in the manner described. I claim also, in combination therewith, the manner of connecting the patella cap by straps, with the screw rod B or with some analogous fixture, by which the jointed parts of the pieces A, A are allowed to stand off from the knee joint, as set forth; not intending, however, by these claims to limit myself to the precise manner of arranging the respective parts as herein designated, but to vary these as I may think proper, whilst the same ends are obtained by means substantially the same. I claim in connection therewith the manner of attaching the apparatus to the foot to favor weak ancles, as described in figs. 3 and 7. Finally, I claim the manner of forming and arranging the several parts in the peculiar combination as herein set forth, by means of which the apparatus is attached to the limbs and body, without entirely encircling the limb at one place, consequently without obstructing the circulation of blood, which prevents the apparatus from causing a numbness or paralyzing effect upon the limbs or body. In short, I claim the manner of attaching the apparatus to the limbs and body, in combination with its outer parts, being constructed and operating substantially as herein described.

Improvement in Machines for moulding and pressing Clay to be applied to the construction of Fences, &c. By MERCY WRIGHT, Tullytown, Bucks county, Ia. May 15th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner in which I have constructed, combined and arranged the machine, for the purpose of moulding and pressing brick clay, so as to form the parts of fences as herein set forth; that is to say, I claim the manner in which I have combined the two revolving platforms, the railways, the car with its moulds, and the roller and scraper, substantially as herein set forth, so that said parts shall coöperate in effecting the object of their construction, as described.

Improvement in Straw Cutters. By JOHN B. KING, Athens, McMinn county, Tenn. May 15th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method of hanging the knife on two pivots that are placed in the two cranks, each having a separate balance wheel attached to it, which balance wheels receive a simultaneous motion produced by means of two drums that are coupled together by a band.

Improvement in the manner of constructing the Stump Extractor. By LUKE F. CAVENAUGH, Newfield, Tompkins county, N. Y. May 15th.

CLAIM.—What I claim as my invention, and which I desire to secure by letters patent, is the bed piece B, and movable bar J, in combination with the screw, nut and carriage, constructed and operating as above described.

Improvement in the process for removing Wool or Hair from the Skins of Animals. By FRANCIS ROBINSON and HANSON ROBINSON, Wilmington, Delaware. May 15th.

CLAIM.—We do hereby declare that we do not claim the use of any particular apparatus for carrying the same into effect, but employ such instruments and means as are now known and used for other purposes; but what we do claim, and desire to secure by letters patent, is the process of loosening the wool or hair, from skins or hides, by the direct application of steam thereto, said skins or hides being suspended in a suitable room or apartment into which steam can be admitted, and said process being conducted substantially in the manner herein set forth.

Improvement in Pumps. By WILLIAM M. WHEELER, Liberty, Clay county, Missouri. May 15th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is constructing the barrel with an enlargement below, and having a plunger, with an aperture in its centre, adapted to said enlargement, in combination with a hollow piston or stem attached to said plunger, and passing up through a portion of the smaller diameter of the pump barrel, having a valve at its upper end to close the aperture in it, through which the water mounts on its descent of the plunger, by which arrangement the apparatus is constituted a lifting as well as a forcing pump; in other words, what I claim is, constructing the apparatus in such a manner that, on every descent of the piston rod, a vacuum or space containing no water is formed in the pump above the plunger, the object of which is to admit a sufficient quantity of water, on every ascent of the piston rod, to keep a constant stream flowing at the discharging pipe, all as herein set forth.

Improvement in the method of constructing Horizontal Pianofortes. By FREDERIC C. REICHENBACH, Philadelphia, Pa. May 19th

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner of constructing and arranging the wrest pin-block and the wrest pins, so that the latter shall pass entirely through the former and receive the pianoforte wire at their lower projecting ends; the whole being arranged and operating substantially as set forth. I likewise claim the peculiar manner of constructing and combining the wrought-iron braces, with the rest plate and straining board; said braces passing over the wrest pin block, bearing against its back edge, resting at their near ends on the straining pin plate *e*, and being formed, secured and operating as herein set forth.

Improvement in the mode of connecting together the frames of the Clothes Horse. By HARVEY LUTHER, Providence, R. I. May 19th.

CLAIM.—I am aware that clothes stands, &c. have been hinged by means of cords or straps attached to square rods, so as to allow them to fold in either direction, and I do not therefore claim this as my invention; but what I do claim, and desire to secure by letters patent, is the peculiar manner in which I make the hinges, that is to say, I claim the making the rods constituting the sides of the frames which come together—rods with grooves in them, in combination with the method of uniting them by means of cords or chains, in the grooves, as herein described.

Improvement in the Recumbent Chair. By HENRY P. KENNEDY, Philadelphia, Pa. May 22d. [Antedated April 12th, 1841.]

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of a spiral spring or springs, with the rails and sliding seat of a recumbent chair, which will allow the seat to be forced forward and the back to assume a reclining posture, and which will restore the seat and back to their ordinary position when the force is removed; the whole being constructed, combined and operating substantially as herein described.

Improvement in Brick Machines. By WALDREN BEACH and EPHRAIM LUKENS, Baltimore, Md. May 22d.

CLAIM.—What we claim as our invention and improvement, and which we desire to secure by letters patent, is,

1. The rotary horizontal wheel C, in combination with the duster F.
2. The box or casing round the bottom of the pressing wheel, in combination with the horizontal wheel C, and hopper B, in the manner set forth.
3. The combination of the horizontal wheel C with the cams F F, in the bottom of the hopper B, the said cams having attached to them a knife I inside the hopper, and a weight or lever G outside of the same.
4. We claim also the manner of combining the pressing roller with the hopper B, in the manner described, viz. by arranging said roller on the outside of the hopper, and connecting it with the same by means of the casing surrounding said roller, as set forth.

Improvement in the Double-Dasher Churn. By ENOS MITCHELL, Pittston, Me. May 22d.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the method of combining the two dashers of the churn by means of the bent lever *h h*, and crossbar *k*, operated by the levers *m* and *o*, attached to the shaft *n*, as above described.

Railroad Cotton Gin. By DAVID PHILIPS, Georgetown, Mercer county, Pa. May 22d.

CLAIM.—What I claim as my invention, and which I wish to secure by letters patent, is the car body described; so constructed as to receive the seed and clean cotton in combination with the supporting and guide wheels, arranged and operating substantially as herein described.

Mode of maintaining Power to drive Machinery. By STEPHEN P. W. DOUGLASS, Williamson, N. Y. May 22d.

CLAIM.—What I claim therein as new, and desire to secure by letters patent, is the manner in which the two endless chains are arranged and connected and combined with the respective wheels or pinions D D and G, and with the weight to be raised, and with the machinery to be propelled, so as to obtain a regular propelling force, either from an intermitting motive power, as herein set forth; the whole being constructed and operating substantially as herein described.

Improvement in Files or Ready Binders for filing Pamphlets, Letters, Papers, &c. By ISAAC DETTERER, Philadelphia, Pa. May 22d.

CLAIM.—I claim as my invention the combination of the book cover, the screw, and the movable handle, serving as the bur or counterpart to said screw, as described above, for the purpose of binding and unbinding, at pleasure, letters, newspapers, music, pattern cards, and other loose sheets.

Improvement in Tailors' Measures. By LYMAN B. and ELLERY MILLER, Walkill, Orange county, N. Y. May 29th.

CLAIM.—We do not therefore make any claim to the individual parts of our instrument; but we do claim the combining of four strips of metal which are to stand horizontally when the instrument is in use, with four others which are to stand vertically, the whole of which strips are made adjustable by means of sliding sockets, and have one measuring tape attached to them; the respective strips and sockets, as well as the other parts of the instrument being combined and operating substantially as herein set forth.

Improvement in the Windmill. By WILLIAM ZIMMERMAN, Stephenson, Rock Island county, Ill. May 29th.

CLAIM.—What I claim therein as my invention, and desire to secure by letters patent, is the weathering of the sails by the action of the sliding rod or piston P, and the disk O, operated upon by the governor substantially in the manner herein set forth, whether the disk be made to operate upon the sails by means of the rods Q Q, by racks and pinions, or by any other device which is the same in principle, and producing a like effect by means substantially the same.

Improvement in the Counter Twist Speeder for Cotton Roping. By JESSE WHITEHEAD, Manchester, Chesterfield county, Va. May 29th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the before described mode of delivering the twisted roving, in the compressed state in which it leaves the twisting bands, at a uniform and regular tension, by means of the aforesaid combination and arrangement of guide block and bobbin.

I also claim the construction of the metallic curved and channeled guide, as described.

Improvements in the Machine for Riving and Dressing Shingles. By WILLIAM S. GEORGE, Baltimore, Md. May 29th.

CLAIM.—What I claim therein as my invention, and desire to secure by letters patent, is the manner in which I have combined and arranged the frame *b b* for holding the bolts, with the vibrating frame *c c*, its panels and riving knife with their appendages, so as to rive shingles from the bolt by an apparatus operating substantially as described. I also claim the within described manner of constructing and combining the dressing and jointing apparatus, the dressing knives being made to approach towards each other, and the jointing frames being affixed and operating in the manner and for the purpose above set forth.

Improvement in Machines for Treeing Boots. By ELIAS HALL, jun. Spencer, Mass. May 29th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the combination of the rubstick F, with the sweep E, in the manner set forth, said sweep having a swivel joint at G, and a hinge joint at H, to allow the rubstick adapting itself to the inequalities of the boot; also, the method of combining the sweep and rubstick with the standard B, by means of the rod C, having a ball on its end adapted to a governor slot on the upper end of the sweep, all as set forth.

Improvement in Presses, for pressing Hay, Cotton, &c. By CHARLES W. HAWKES, Brunswick, Me. May 29th.

CLAIM.—What I claim as my invention, and desire to secure by letters patent, is the manner in which the racks are combined with the follower of the press by being attached to the uprights H H outside of the box, and connected with each other and with the follower by the cross beam I, as set forth.

Improvement in the construction of Pumps. By SIDNEY S. HOGLE, Lansingburg, N. Y. May 29th.

CLAIM.—What I claim as my invention is the combination of the suction and lift pistons so as to produce an alternate action, as described, by means of the shaft Q, constructed with cams F^1 and F^2 or eccentric grooves g^1, g^2, and the pulleys or rollers P^1 P^2 P^3 P^4, attached to the head of each piston D and E, the whole being constructed and operated in the manner set forth.

Improvement in Tobacco Presses. By THOMAS G. HARDESTY, Tracy's Landing, Ann Arundel county, Md. May 29th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner in which I construct and employ the two false hogsheads by placing them horizontally in a range with the hogshead to be packed, and pressing simultaneously from each end, as set forth. I also claim the so arranging of the parts of the press as that two followers may be forced up, or from each end thereof, by means of the pressing screws, operated by female screws or boxes attached to the power wheels.

Improvement in the manner of sustaining Logs in Sawmills. By JEREMIAH ROHRER, Rohrersville, Washington county, Md. May 29th.

CLAIM.—What I claim therein, and desire to secure by letters patent, is the manner in which I have arranged and combined the two rollers for making pressure upon the upper and lower parts of a log, when being sawed in a sawmill. I am aware that a single roller has been used for supporting a log, but this has not been made to operate in the manner described by me, nor do I know or believe that there has previously existed any combination similar to that herein described, by which two rollers were made to coöperate in sustaining the stuff. I do not claim, therefore, the employment of a single roller under the log; but I do claim the manner in which I have made the lower roller to operate, by causing the same to rise and fall vertically, and to be made self-operating when it is to be removed from under the log, the respective parts thereof being constructed and arranged substantially in the manner set forth, and being used in combination with the upper roller, operating as herein described.

Improvement in Machinery for Hoisting. By J. B. HOLMES, Boston, Mass. June 7th.

CLAIM.—The machinery, therefore, except the grooved roller N, I do not claim, but what I do claim as my inventions and improvements, and desire to secure by letters patent, are, first, the arrangement of the barrels which hold the rope, without an outside framing, as herein described; and second, the combining therewith in the manner set forth, a grooved roller N, to press the rope against the barrel on its passage therefrom, for the purpose of preventing any slipping of the rope which the action of the weight at the other end has a tendency to produce, being constructed and operating as herein described.

Improved method of Block Printing on Woven Fabrics of Cotton, Linen, Silk, Woolen, &c. By ROBERT HAMPSON, Manchester, Great Britain. June 7th. [Antedated June 19th, 1840, date of English patent.]

CLAIM.—I declare that I claim as of my invention the apparatus or machinery, constructed as herein before set forth, for printing with blocks on woven fabrics of various kinds; that is to say, I claim the combining of a block for printing in various colors with the apparatus or mechanical agents for causing said block to descend in a perpendicular direction, in order to take up the color from the sieve or sieves, and to impress the pattern or design upon the fabric; said apparatus or mechanical agents consisting of the cross frame *g g*, the arms Z Z, the straight edges at the corners of the frame, the rod H, the band and counterweight, with their appendages, the whole being so connected as that by raising the counterweight, the cross frame and block will descend, and the color be received on the block, or the impression given to the fabric; and I claim the same, however the said mechanical agents and contrivances may be modified or varied in size, form, proportion or other particulars, not departing from the principle of my said invention. But I do not claim as of my invention such mechanical agents or contrivances separately, but only as combined to effect the purpose afore-

said. Nor do I claim as part of my said invention the apparatus herein before described, for traversing the coloring apparatus to and fro by means of a railway and carriage running thereon, the same, although invented by me, having been by me used and practiced previous to the grant of the said letters patent; nor do I claim as of my invention the arrangement of rollers and connected apparatus for causing the fabric to traverse or be drawn over the printing table, and conveyed away when printed. And I further declare that I claim as of my invention such coloring apparatus, as herein before described, in which several sieves are separated and held apart to admit of the several colors being distributed and teared or spread thereon, without admixture or interference one with another, and whereby the sieves are afterwards closed or brought into juxtaposition, in order to the colors being taken up by the block, so as to produce at one impression of the block, or pattern, or design, in several colors arranged contiguous or near to each other, herein before described, and which coloring apparatus I claim, whether the same be used in conjunction with the machinery and apparatus for giving the impression to the fabric before described, or with the common hand block, or otherwise, and under whatsoever other modification.

Improvement in the Machine for turning Handles, Poles, &c. By COLLINS & WISTAR, assignees of STACY COSTILL, Philadelphia. June 7th.

CLAIM—What I claim as my invention, and desire to secure by letters patent of the United States, is the cutter in combination with the movable segments, and these thus combined in combination with the eccentric grooves in the plate C, for the purpose and in the manner described.

LIST OF ENGLISH PATENTS

GRANTED BETWEEN THE 27TH OF APRIL AND THE 26TH OF MAY, 1841.

André Dronot de Charlien, of Coleman-street-buildings, gentleman, for improvements in preparing matters to be consumed in obtaining light, and in the construction of burners for burning the same. (A communication) April 27; six months to specify.

James Sims, of Redruth, Cornwall, civil engineer, for certain improvements in steam-engines. April 29; six months.

Alfred Jeffery, of Prospect-place, New Hampton, gentleman, for a new method of defending the sheathing of ships and of protecting their sides and bottoms. April 29; six months.

George Townshend, of Sapcott-fields, Leicester, esquire, for improvements in machinery or apparatus for cutting certain vegetable substances. April 29; six months.

Joseph Gibbs, of Kensington, civil engineer, for a new combination of materials for making bricks, tiles, pottery and other useful articles, and a machine or machinery for making the same, and also a new mode or process of burning the same, which machine or machinery and mode or process of burning are also applicable to the making and burning of other descriptions of bricks, tiles and pottery. April 29; six months.

Miles Berry, of Chancery-lane, for certain improvements in machinery or apparatus for making or manufacturing nails and brads. (A communication.) May 4; six months.

Francis Joseph Massey, of Chadwell-street, Middleton-square, watch manufacturer,

for improvements in the method of winding up watches and other time keepers. May 4; six months.

Edward Newton, of Leicester, manufacturer, and James Archbold, of the same place, machinist, for improvements in producing ornamental or tambour work in the manufacture of gloves. May 4; six months.

Charles Thomas Holcombe, of Bankside, Southwark, iron merchant, for certain lubricating or preserving matters for wheels and axles, applicable also to the bearings, journals, or other parts of machinery. May 6; four months.

Hugh Graham, of Bridport-place, Hoxton, artisan, for an improved manufacture of that kind of carpeting usually denominated Kidderminster carpeting. May 6; two months.

Moses Poole, of Lincoln's Inn, esquire, for improvements in the manufacture of fabrics by felting. (A communication.) May 6; six months.

Philemon Augustine Morley, of Birmingham, manufacturer, for certain improvements in the manufacture of sugar moulds, dish covers, and other articles of similar manufacture. May 6; six months.

James Hancock, of Sidney-square, Mile End, civil engineer, for certain improvements in the manufacture of locks, keys, latches, and other fastenings, part of which improvements are applicable to taps and cocks for drawing off fluids. May 6; six months.

John Paley, jun. of Preston, manufacturer, for certain improvements in looms for weaving. May 10; six months.

Hooton Deverill, of Nottingham, lace manufacturer, for certain improvements in machinery for making and ornamenting lace, commonly called bobbin net lace. May 10; six months.

Andrew McNab, of Paisley, North Britain, engineer, for certain improvements in the manufacture of bricks. May 11; four months.

Edmund Taylor, of King William-street, gentleman, for certain improvements in the construction of carriages used on railroads. (A communication.) May 11; six months.

Henry Pinkus, of Maddox-street, Saint George, Hanover-square, for an improved method or methods of applying electrical currents or electricity, either frictional, atmospheric, voltaic, or electro-magnetic. May 14; six months.

James Gregory, coal master, and William Green, tinner, both of West Bromwich, for certain improvements in the manufacture of iron and steel. May 14; six months.

Pierre Journet, of Dean-street, Soho, engineer, for improvements in fire-escapes, which improvements are applicable to other useful purposes. May 19; six months.

John Carr, jun. of Paddington, engineer, for improvements in apparatus for retarding and stopping railway carriages. May 20; six months.

Charles Phillips, of Chipping Norton, engineer, for improvements in reaping and cutting vegetable substances as food for cattle. May 20; six months.

Joseph Woods, of Laund-place, Lambeth, civil engineer, for certain improvements in locomotive engines, and also certain improvements in machinery for the production of rotary motion for obtaining mechanical power, which improvements in machinery are also applicable for raising or impelling fluids. May 22; six months.

William Gall, of Beresford-terrace, Surrey, for certain improvements in the construction of inkstands. (A communication.) May 22; six months.

John Ainslie, farmer, Redhingh, North Britain, for a new and improved mode of making or moulding tiles, bricks, retorts, and such like work, from clay and other plastic substances. May 22; four months.

Christopher Dumont, of Mark-lane, for improvements in the manufacture of metallic letters, figures, and other devices. (A communication.) May 22; six months.

John Winterborn, of Clarence-place, Hackney-road, surgeon, for improvements in machinery to facilitate the removal of persons and property from premises in case of fire, which improvements are applicable to raising and lowering weights generally, to assist servants cleaning windows, and as a substitute for scaffolding. May 22; six months.

William Lewis Rham, of Winkfield, Berks, clerk, for certain improvements in machinery or apparatus for preparing land and sowing or depositing grain, seeds, and manure. May 25; six months.

John Whitehouse, of Deptford, engineer, for an improved method of making boilers to be used in marine steam-engines. May 25; six months.

William Joest, of Ludgate-hill, merchant, for improvements in propelling vessels. (A communication.) May 26; six months.

LIST OF PATENTS GRANTED FOR SCOTLAND FROM THE 22D OF APRIL TO THE 22D OF MAY, 1841.

Ezra Jenks Coates, of Bread-street, Cheapside, London, merchant, for improvements in the forging of bolts, spikes, and nails. Sealed April 28, 1841. (A communication from abroad.)

John Watson, of Glasgow, Scotland, merchant, for improvements in printing fabrics where discharging presses are used. April 28.

John Haughton, of Liverpool, clerk M. A., for improvements in the means employed for preventing railway accidents, resulting from one train overtaking another. April 28.

James Ransome and Charles May, of Ipswich, Suffolk, machine makers, for improvements in the manufacture of railway chairs, railway and other pins or bolts, and in wood fastenings and trenails. April 28,

Peter Fairbairn, of Leeds, York, engineer, and William Suttill, of Newcastle-upon-Tyne, flax-spinner, for certain improvements in drawing flax, hemp, wool, silk and other fibrous substances. April 28

William Newton, 66 Chancery-lane, Middlesex, civil engineer, for improvements in spinning and twisting cotton, and other materials capable of being spun and twisted. April 30. (Being a communication from abroad.)

Thomas Robinson, of Wilmington-square, Middlesex, gentleman, for improvements in drying wool, cotton, and other fibrous materials, in the manufactured and unmanufactured state. April 30. (Being a communication from abroad.)

Lancelot Powel, of Clydach works, Brecon, ironmaster, and Robert Ellis, of Clydach aforesaid, agent, for improvements in the manufacture of iron. May. 5.

William Edward Newton, 66 Chancery-lane, Middlesex, civil engineer, for certain improvements in the process or method of manufacturing lime cement, mastic artificial stone, stucco, and other similar compositions possessing the useful properties of hardness, color, and indestructibility when exposed to damp. May 7. (Being a communication from abroad.)

David Walther, of Angel Court, Throgmorton-street, London, merchant, for certain improvements in the methods of purifying vegetable and animal oils, fats, and tallows, in order to render those substances more suitable for soap making, or for burning in lamps, or for other useful purposes, part of which improvements are also applicable to the purifying of the mineral oil or spirit commonly called "petroleum or naphtha, or coal tar, or spirit of coal tar." May 7. (Being a communication from abroad.)

James Whitelaw and George Whitelaw, engineers, residing in Glasgow, Scotland, for a new mode of propelling vessels through the water, with certain improvements in the steam-engine when used in connection therewith, parts of which improvements are applicable to other useful purposes. May 10.

Thomas Lawes, of Canal Bridge, Old Kent Road, Surrey, feather factor, for certain improvements in the method or process and apparatus for cleansing and dressing feathers. May 10. (Being a communication from abroad.)

Angier March Perkins, of Great Coram-street, Middlesex, engineer, for improvements in apparatus for heating by the circulation of hot water, and for the construction of pipes or tubes for such and other useful purposes. May 12.

George Dacres Paterson, of Truro, Cornwall, esquire, for the following improvements in curvilinear turning, that is to say, a rest adapted for cutting out wooden bowls, and a self-acting slide rest for other kinds of curvilinear turning. May 12.

William Kenworthy, of Blackburn, Lancaster, spinner, and James Ballough of the same place, overlooker, for certain improvements in machinery or apparatus for weaving. May 17.

Christopher Dumont, of Mentz, Germany, but now of Mark-lane, London, for improvements in the manufacture of metallic letters, figures, and other devices. May 17. (Being a communication from abroad.)

John Paley, jun. Preston, Lancaster, manufacturer, for certain improvements in looms for weaving. May 20.

LIST OF IRISH PATENTS GRANTED FOR APRIL, 1841.

F. Sliddon, jun. certain improvements in machinery or apparatus for roving, slubbing, and spinning cotton and other fibrous substances.

C. Cameron, certain improvements in engines to be actuated by steam or other elastic fluids.